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The Long Succession

MANY years ago in his "Traité sur la Vide" Pascal wrote that "The long succession of the generations of mankind should be regarded as a single man, ever living and ever learning." A glance backwards over the history of scientific discovery and scientific industry shows the essential truth of that dictum in the chemical field. Great men rise, make their discoveries, and die; but neither science nor industry fades when the stars of the pioneers set—others arise to take their places.

The juxtaposition of certain events in the month that has passed has given a clearer vision of this than usual. We bemoan the death of a great physicist in Lord Rutherford. The name of his master and predecessor at Cambridge, Sir J. J. Thomson freely besprinkled the pages of the text-books that many of us studied at the universities and the continuance of these classic researches into the constitution of matter by Rutherford has been followed by many with fascinated admiration. In an age of specialisation, Rutherford showed that specialisation was not necessarily the key to success. It is recorded of him that "he obtained a sound instruction in mathematics with which he was able to control the wilder flights of the imagination" of his associates.

It cannot be said that Rutherford made major discoveries that have been turned to account in industry. That, however, may be reserved for the future. It is essential that there should be men set apart to push forward the boundaries of knowledge, like explorers in the geographical field, leaving to others the task of industrial development. The impossibility of expecting academic research to be conducted by those who have to account for their time and expenditure will have been made abundantly clear from Professor Travers' Melchett lecture to the Institute of Fuel. The subject chosen was the work now being conducted at Bristol University on the thermal reactions of the simpler hydrocarbons, the ultimate object of this work being to permit the reaction velocity to be calculated from ascertainable physico-chemical constants, just as the probable course of a reaction and the extent to which it will go in infinite time can be calculated from thermodynamics. It is necessary to determine the number of collisions in unit time and the orientation factor of these molecular collisions in the reacting gas, together with the energy of activation, this latter being the extent to which the energy of any given collision is in excess of a given known mean value. It took two years to work out the technique of the method. Even this result was only rendered possible by reason of the experience gained by Professor Travers as Sir William Ramsay's assistant during the discovery of the rare

gases of the atmosphere—another example of "the long succession." Only with ethane, or (which comes to the same thing) with equilibrium mixtures of ethane, ethylene and hydrogen, has it yet been possible to determine the complete conditions. The energy of activation has been found to be 55 k.cals; and the orientation factor 0.25. In words, this means that of the collisions of ethane and ethylene molecules at 590° C. for which the excess energy is 55 k.cals, one in four is effective and results in chemical change. One day, when the theory has been fully worked out, this work will be of the utmost value to chemical engineers resulting in an extension to their science possibly as great as that of thermodynamics; perhaps it will be called "thermo-kinetics." It would be impossible for such work to be done amid the stress of industrial life.

One great industrialist has recognised this fact to the full. The munificent benefactions of Lord Nuffield are a permanent memorial to the worth of scientific work, as seen by a business man of international reputation who has not himself had the advantages of a scientific training. Past benefactions have shown that Lord Nuffield knows the value of research into pure science—it is only necessary to mention his recent gift of £100,000 to erect and equip a new laboratory of physical chemistry at Oxford. He recognises, nevertheless, that in certain fields it is desirable that practical men of the world should assist the theoretical investigators. That is the thought underlying his recent gift of £1,000,000 to found a new college at Oxford. The new college is to be devoted to the collaboration, particularly in social studies, of theoretical students and practical men of affairs. He feels, as do many others, that it is desirable to find some way to "bridge the separation between the theoretical students of contemporary civilisation and the men responsible for carrying it on."

Certain remarks made by Lord Nuffield in announcing his gift are worthy of note by those engaged in industry. "I have long deplored," he says, "the comparative scarcity of university graduates in the highest posts on the administrative and managerial sides of industry. . . . The success of university graduates in the Civil Services suggests that their scarcity in industry must be partly due to the failure of employers to appreciate the qualities which a university education fosters in a young man or woman; but my own experience convinces me that it is also partly due to the gulf which at present exists between academic studies and practical affairs." There, it seems, lies the answer to much of the argument that periodically breaks out as to the relative merits of the university-trained chemist and the chemist who has received most of his training in the works.

Notes and Comments

Co-operation between Chemical Bodies

FROM time to time schemes have been put forward for bringing about a closer co-operation between the important chemical bodies. So far these schemes have failed. Professor T. P. Hilditch, speaking at Liverpool last week, said that he felt that the Chemical Council would in due course play a very important part in such co-operation and the Council is already doing important work in assisting the library of the Chemical Society. [This may be a small beginning but it is an example of what can be done by co-ordinative methods. Whether complete amalgamation of the chemical bodies is possible or desirable is a questionable matter. Each body has its own field of activities which is fairly sharply defined and little therefore would be gained by amalgamation. Indeed, a corporation comprising the important chemical bodies would most probably prove unwieldy in practice and its functions not of such intimate interest to the individual member. On matters of importance to the chemical industry and profession as a whole, however, a close co-operative movement, such as is found in the Chemical Council, can do nothing but good.]

Storage Rules

IT is an obvious precautionary measure to ensure that unauthorised and unskilled employees cannot gain access to chemicals which are liable to introduce health, fire, or explosion hazards in use. Some scheme of organisation must be devised whereby dangerous chemicals are comparatively readily accessible to those experienced employees who require them for their work in the factory and at the same time render them unobtainable by the unskilled. This problem is common to the chemical industry and the large number of chemical-using industries. The National Safety First Association reports that a member firm proposes to draw up a special set of rules for the storage of all dangerous chemicals used by them. These rules will state where supplies of each chemical are to be kept, whether they are to be locked up and if so who is to have the keys, and what precautions are to be taken when supplies cannot be locked up—for instance, when small quantities must be readily available in workrooms. Before issuing these rules the firm concerned would like to know whether such storage rules have been drawn up by other firms. The association would be grateful for any information on the subject.

Costs in the Sugar Beet Industry

THE Sugar Commission appointed by the Sugar Act of last year to review the production and marketing of sugar in this country and to advise the Minister of Agriculture on problems of the sugar beet industry has issued its report for the year ending March 31. It is in the main a depressing account and holds out little hope for satisfactory conditions during the remainder of this year. The outstanding difficulties are shortage of labour, increase in the farmers' costs and bad weather conditions. [The labour which can be obtained can only be obtained at a price, so that it represents over one-third of the growers' production costs. The cost of beet represents about three-fourths of the cost of sugar manufacture. The commission has increased beet prices by about 1s. to 2s. per ton owing to the growers' unfavourable position. The commission is able to record, however, that the amalgamation of the fifteen beet sugar companies

into a single corporation has led to greatly increased efficiency. It is evident that the matter turns essentially on the cost of beet. At its present price it is responsible for three-quarters of the total cost of producing the refined sugar, which cannot be said to be an economically sound proposition. If the price paid for beet is lowered, the farmer will cease to grow it, as his labour and other costs would render it unprofitable for him to do so. The commission has fixed a price which is as equitable as possible to both sides, but the future success of the industry lies in the maintenance of a world price in closer relationship to production costs. The commission hopes that the International Sugar Agreement may bring this about.]

Chemical Stoneware Pipes

PIPES are the arteries and veins of a chemical plant; there must be a minimum risk of failure when processing is in progress. They are, moreover, the most flexible of all systems for conveying chemical liquids and gases, as well as water and steam. The plant engineer has a wide range of materials from which to make his choice; apart from metals—ferrous and non-ferrous—there is hard rubber, fused silica, chemical stoneware and even wood. Initial cost, mechanical strength, length of life, and resistance to the action of corrosive liquids or gases are the main features which have to be considered to secure the most economical installation. Too many plant engineers, nevertheless, do not go far afield from steel, copper and lead. When chemical stoneware is indicated they often look upon that material as being too clumsy, even if it proves to be very suitable in resisting particular corrosive action; they also consider it to be brittle, and in consequence of this false impression of its general utility in handling corrosive liquids they are—to their own disadvantage—dilatory in adopting it. In nearly all cases where corrosion is continually making it necessary to replace a length of pipework it will be found that troubles can be avoided by installing stoneware pipes and that maintenance costs are then almost eliminated. Sometimes stoneware may be adopted very successfully at that particular point where corrosion is most in evidence.

Polymerisation of Isoprene

A NEW method of polymerising isoprene which yields a soluble polymer only is described by W. H. and M. O. Carmody in a note published in the *Journal of the American Chemical Society*. Previous work has shown that when isoprene is polymerised with aluminium chloride, two types of polymers are formed: insoluble higher polymers and soluble lower polymers. By carrying out the polymerisation in the vapour phase, the formation of insoluble polymer is precluded. Isoprene vapour in a closed system impinges on a bed of aluminium chloride and is polymerised. At the end of the reaction, the catalyst mass is disintegrated, neutralised with ammonia and filtered. On distilling the filtrate the soluble resin is obtained. [The molecular weight of this new polymer was determined to be about 1,300—approximately double that of the soluble polymer obtained by the usual liquid phase polymerisation. The experiment was carried out at a temperature of 24°-26°, the effect of increased temperature on the system might prove interesting. It would certainly accelerate the catalytic polymerisation, but it might also have the effect of producing a considerable proportion of insoluble polymer. The solubility characteristics of the new soluble resin were not described in the note, apart from the fact that it was soluble in hydrochloric acid.]

Developments in Phosphoric Acid Manufacture

Investigations of Nordengren and his Collaborators

By

DR. H. LEHRECKE*

THE work begun by Nordengren and his collaborators in Landskrona in 1926 had for its primary object the discovery of a cheap method of producing phosphoric acid, to be used for the enrichment of superphosphate. In Sweden at the time it was the practice to mix high-grade South Sea phosphates or Curacao phosphate, with Florida or African phosphates, in order to produce a calcium superphosphate containing 20 per cent. of P_2O_5 . The continuance of this method was threatened, by reason of the progressively diminishing quantity of high-grade phosphates available.

Before the enrichment process with phosphoric acid was conceived, it will be recalled that the question was raised, whether it would be possible to increase the P_2O_5 content of the superphosphate by reducing the water of crystallisation of gypsum ($CaSO_4 \cdot 2H_2O$). It was believed then that superphosphate contained gypsum, as distinct from anhydrite ($CaSO_4$), or the hemi-hydrate ($CaSO_4 \cdot \frac{1}{2}H_2O$). As the investigations proceeded at Landskrona, it became evident that the foregoing view was erroneous, and that calcium sulphate is largely present in superphosphate, essentially as anhydrite. Despite the fact that no announcement was made at the time of this significant result, it will be interesting to record that the precise form in which calcium sulphate existed in superphosphate was revealed by the investigations conducted by Nordengren and his collaborators. In view of what has been remarked, it was obvious that the phosphoric acid content of calcium superphosphate could not be increased by eliminating or reducing the water of crystallisation of gypsum, and that some alternative method was called for. A method of enriching superphosphate by incorporating phosphoric acid as such during mixing had much to commend itself, and on reflection it was decided that this method should be pursued. The idea of manufacturing superphosphate in this way was not unknown. Indeed, it was appreciated that it could be undertaken without any technical difficulties, provided the phosphoric acid was available in a sufficiently concentrated form.

The problem to be solved was the production of phosphoric acid having a concentration of at least 30 per cent. P_2O_5 from sulphuric acid of 54—55° B ϕ . The concentration in question was necessary, in order to avoid an unduly high moisture content in calcium superphosphate. Phosphoric acid of the required strength had hitherto only been produced by thermic methods, but such a way could not be contemplated, by reason of considerations of cost.

*Contributed to the meeting of the International Superphosphate Manufacturers' Association in Hamburg on October 12.

The "wet" methods available did not admit of phosphoric acid being produced, of a greater concentration than 22—23 per cent. P_2O_5 , and as such methods were based on the decantation principle, the plants and buildings were alike expensive and unwieldy. The principle of decantation for separating the insoluble calcium sulphate was abandoned at the outset, and Nordengren and his collaborators directed their efforts to evolving a method by which phosphoric acid containing at least 30 per cent. P_2O_5 could be manufactured direct: the calcium sulphate being separated from the phosphoric acid by a process of filtration. A process on the foregoing lines was soon developed, and the first phosphoric acid plant was built at Landskrona in 1928.

The Autoclavic Process

The process, as originally evolved (it has since been abandoned), consisted of a reaction between phosphate rock and sulphuric acid, in the presence of phosphoric acid circulated in the process in an autoclave. It was based on the newly-discovered principle that crystals of excellent condition, allowing of easy filtration, could be produced, when calcium sulphate was formed under carefully-regulated conditions of temperature and concentration as hemi-hydrate or anhydrite. Moreover, it was revealed that it was possible so to regulate the reaction that this crystalline formation remained unchanged during the filtration and washing processes, without any tendency to hydration. The required temperature of reaction, viz., 125° C. and upwards, when the concentration of phosphoric acid was about 30—35 per cent. P_2O_5 , could obviously only be attained in pressure vessels of the type of an autoclave.

The first installation worked intermittently with two autoclaves: the acids employed, but not the autoclaves, were heated. The plant had a comparatively small capacity: filtration was effected in a peculiarly simple manner in wooden boxes, lined with lead, the thickness of the filter cake being about 8 inches. Counter-current washing of the cake was resorted to, and it was found very effective. The cake was removed by hand, and during this procedure the jute filter cloth was destroyed.

Landskrona Belt-Filter

While the foregoing temporary method of working served its purpose, it was appreciated that any large-scale process would necessitate a mechanical device involving less manual work, and the use of less filter cloth. During the period 1930-1932, many types of mechanical filters were operated, in

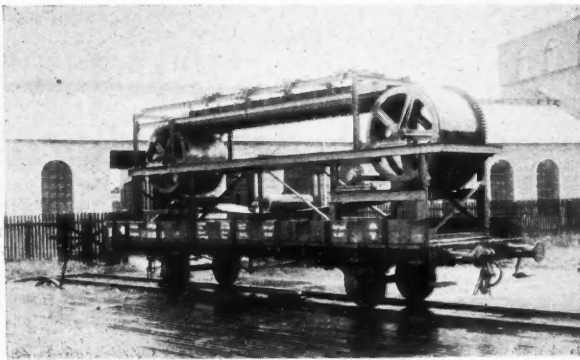
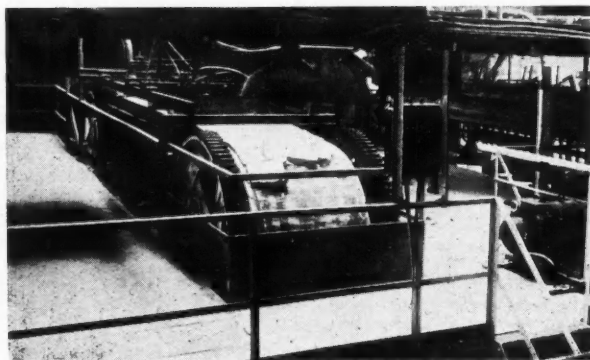


Fig. 1 (left) Landskrona Belt-Filter working in a Belgian phosphoric acid plant. Fig. 2 (right) Landskrona Belt-Filter for a Dutch phosphoric acid plant.

the hope that sooner or later it would be possible to construct one that incorporated most of the essential features called for in connection with the newly-developed process.

The filtration, on a large scale, of a warm phosphoric acid-containing sludge with such a high concentration of P_2O_5 , is a more onerous unit process than is usually encountered in chemical engineering. The features which an ideal mechanical filter should possess may now be indicated:—

1. Continuous operation, requiring only a minimum of supervision.
2. Ability to resist the corrosive influences of warm phosphoric acid of high concentration, containing small amounts of the derivative products of fluorine and free sulphuric acid.
3. Complete separation of the calcium sulphate from the mother liquor: counter-current washing of the calcium sulphate, to ensure practically complete elimination of the occluded phosphoric acid, with minimum dilution.
4. Filter cake of uniform thickness, free from surface cracks.
5. Ability to use a high vacuum, in order to obtain a dry filter cake.
6. Construction without narrow passages, and easy access to all parts for cleaning purposes.
7. Continuous cleaning of the filter cloths during the process of filtration, in order to maintain the throughput of filtration, and to ensure high durability of the texture.
8. Flexibility in the production of different washing fractions, in order that varying qualities of phosphate rock can be suitably treated.

All the foregoing stringent conditions are fulfilled by a new type of filter, developed at Landskrona, and introduced to the industry under the name of the Landskrona Belt-Filter. As will be appreciated from this name, the process of filtering is combined with the transport of the sludge or the filter-cake on belts. There are two belts: the under-belt has a channel, or disc section, and carries another perforated belt on which, in turn, the filter cloth is supported. The under-belt, throughout the length between the pulleys, passes over a long narrow suction box, that can be divided into sections, each taking a fraction of the filtrate. The first technical filter was installed at Landskrona in 1932-33. Figs. 1 and 2 each show a 5-metre-square filter, which were delivered respectively to Belgian and Dutch phosphoric acid works. The adaptability of the Landskrona Belt-Filter to other filtering propositions, especially such as are combined with the washing of the cake, is at once obvious. Indeed, this special filter has been applied for a variety of purposes. Moreover, the Landskrona Belt-Filter has also been employed for reducing the water content of sludges, as in the preparation of ores, etc. This is a typical example of how the solution of a technical problem can be applied with advantage to other fields of work.

Open Anhydrite Process

Concurrently with the demand for the construction of a special mechanical filter, adapted to plants of greater capacity, the question arose, whether in larger plants it would be possible to dispense with the autoclavic process, which had the disadvantage that not only did it involve expensive installations, but it was not continuous in operation. A profound investigation was undertaken of the laws governing the conditions in which calcium sulphate containing less than 2 molecules of water, in the case of gypsum, existed in phosphoric acid at different temperatures and concentrations of P_2O_5 . The results are shown in diagram, Fig. 3. On the abscissae are the P_2O_5 concentrations in the reaction mass, and on the ordinate are the temperatures. The curve A shows the conditions under which such hemi-hydrate, still possessing the power of absorbing water, as water of crystallisation, is formed. Under this curve, gypsum—the di-hydrate—is stable. Curve B shows the conditions that lead to stable hemi-hydrate. In the field above this curve is situated an area where the stable anhydrite can be formed. This is the

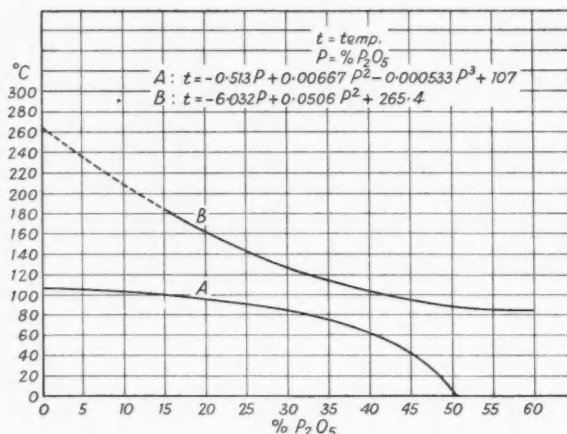


Fig. 3.

same form of calcium sulphate as we find in superphosphate.

From this diagram it is clearly seen why it is necessary to work in autoclaves with phosphoric acid at concentrations of 30–35 per cent. P_2O_5 , when calcium sulphate of low water of crystallisation, in a stable form, is demanded, because under such conditions temperatures of at least 115–127° are reached (see Curve B). If, however, the concentrations of phosphoric acid are further increased, it is possible to reduce the temperature, and at a concentration of about 38 per cent. P_2O_5 , an area is reached where the reaction temperature is lower than the boiling point of the solution. Hence it is possible, at these high concentrations, to allow the reaction to take place in open vessels.

To work in such a way, it was necessary to dispose of a circulating phosphoric acid, with a concentration of adequate strength, and to produce such an acid, of such a concentration, as a second filtrate, at the filtering process. Only in this way was the use of sulphuric acid of 60° Bé., or of lower concentration, say, 58° Bé., feasible. The development of the new filter admitted of the realisation of what was demanded, in that this circulating phosphoric acid, within the filtering process, can be produced with a P_2O_5 content only 4 per cent. less than the content of the product obtained.

Based on these fundamental conditions, and aided by the technical means thus rendered available, the so-called anhydrite process was tried out. It was found possible to produce a phosphoric acid with 40–45 per cent. P_2O_5 in open vessels. The reaction can be carried out either continuously or intermittently. In the first case, three-four reaction tanks are used, the first two being heated. From the last tank, the pulp is pumped to the Belt-Filter. Here the acid is withdrawn, and the calcium sulphate is washed in counter-current with three washes, two containing acid of weaker concentration, and the other water. The yield of the washing process is 98 per cent. or more, and the overall yield of the process is more than 94 per cent.

Initially, the process caused some difficulties, the chief of which was the inability to obtain a filter cloth having adequate resistance. The common filter cloth was incapable of withstanding the strong warm phosphoric acid. It was ultimately found necessary to use nitrated cloth, which at the time was not easy to obtain. Now it is possible to buy a nitrated strong cotton cloth without difficulty, and at a reasonable price.

The anhydrite process is the only one that admits of phosphoric acid of 40 per cent. P_2O_5 or more being produced direct from any variable phosphate rock on the market, and sulphuric acid. It should be remarked that the phosphate rock need not necessarily be ground finer than for the production of superphosphate.

Evaporator

If double superphosphate is to be manufactured from phosphate rock and phosphoric acid, a concentration of 40–45 per cent. P_2O_5 in the acid is not sufficiently high; indeed, a con-

centration of at least 50 per cent. P_2O_5 is essential. With such an acid, double or triple superphosphate can be manufactured in the same way, and in the same plant, as ordinary superphosphate, and there will be no necessity to dry the product. From this viewpoint, investigations were conducted as to how phosphoric acid of different strengths could be concentrated with facility, and at a minimum cost. When technical acids are being evaporated, difficulties arise because the calcium sulphate and other impurities precipitate as the concentration of P_2O_5 increases, and such precipitate adheres to the walls or pipes of the evaporator, rendering the transmission of heat difficult, and withal occasioning considerable work in the matter of cleaning.

An evaporator should be constructed in such a way that depositions of calcium sulphate are avoided, or at least only occur at such points which admit of easy cleaning, and where no damage can be done.

These were the considerations that one had in mind when the new evaporator was constructed, using heated gases, which are blown through the acid, as the source of heat, rather than steam. Such heat may be obtained free of cost in superphosphate plants having sulphuric acid installations, where the pyrites furnaces are cooled with air. The air is discharged from the furnaces at a temperature of 250–300° C., usually into the atmosphere. The new evaporator has specially-constructed lead-lined mouthpieces, through which the heated air is blown with the aid of a fan, giving a pressure of 150–200 mm. (water pressure). Gases are discharged at a tolerable velocity under the surface of the phosphoric acid. The construction of the mouthpiece affords highly effective heat transmission, and the gas temperature at the outlet is only a few degrees higher than the temperature of the acid (60–70° C.). The power necessary for the evaporation of 1,000 gal. of water in 24 hours is only about 4.4 horse-power, so that when heat is available free of cost, the evaporation is inexpensive. One is not limited to the one source of heat indicated: combustible gases as a source of heat, with the admission of air, give a satisfactory temperature, and, of course, air can be heated in other ways to advantage.

The supervision and cleaning of the plant only involve a relatively small amount of time. The feed of acids, as well as their concentration, are from time to time controlled by one man, who also, once a day, cleans the mouthpieces. Each week a thorough cleaning of the equipment is undertaken. The waste gases are led to a scrubber, where the fluorine compounds are absorbed in water. In the plant installed at Landskrona, which is shown in Fig. 4, three to four tons of P_2O_5 daily are concentrated, from 30–50 per cent. P_2O_5 .

Open Dihydrate (Gypsum) Process

In view of the inexpensive method of concentrating phosphoric acid which had been developed, the question arose whether it would not be an economic proposition to manufacture phosphoric acid of lower strength, and subsequently resort to concentration in the evaporator. Under such conditions, it would obviously be cheaper to effect the decomposition in open vessels, without heating. A glance at the diagram, Fig. 3 reveals that this is only possible subject to calcium sulphate being formed as gypsum.

With the older methods of decomposition, the calcium sulphate was precipitated as gypsum, but it was only possible to produce acids of 22–23 per cent. P_2O_5 in a direct way. This was attributable to two causes: (a) separation by decantation, by which the mother liquor became diluted; and (b) at higher concentrations poorly or not easily filtrable crystals of gypsum were obtained.

Thorough investigation has now revealed that it is possible to increase the concentration of the phosphoric acid up to 30 per cent. P_2O_5 , and simultaneously obtain excellent crystals of calcium sulphate as dihydrate, allowing of easy filtration, if the decomposition is regulated in a suitable manner. The factors governing the foregoing are (a) temperature and concentration; (b) the proportion of the components; and

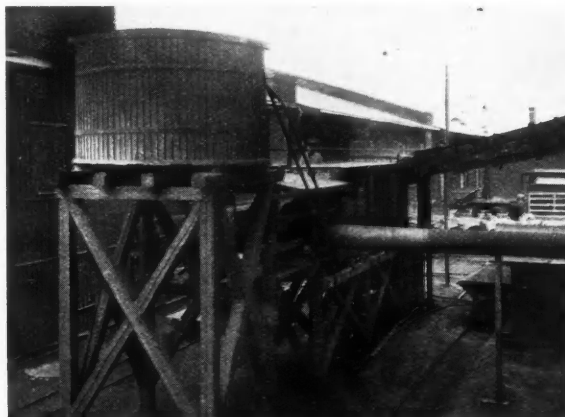


Fig. 4. Evaporator for phosphoric acid working in Landskrona.

(c) the way in which these are charged. Another condition necessary to admit of the attainment of such concentration, with the possibility of obtaining strong acids of easy filtration, is an equipment possessing the features of the Belt-Filter. It will be appreciated that it is not necessary, in this process, to heat the decomposition vessels, nor indeed the acids. The filtering process can be performed with the usual wool cloth, and it is very cheap, as only 0.3–0.4 square metres are destroyed per 100 kgms. of P_2O_5 produced. As regards washing, only one wash is required, except the water one. Phosphoric acid is produced, containing 25–30 per cent. of P_2O_5 , dependent on the quality of the phosphate rock treated. The process can be worked continuously or intermittently, with all qualities of phosphate on the market. Indeed, African phosphate, which hitherto has generally caused difficulties, can be used. The total yield is 94 per cent. or more.

A schematic outline of a phosphoric acid plant for the production of 10 tons of P_2O_5 per 24 hours, according to the method in question, is shown in Fig. 5. The decomposition unit is, in point of size and arrangement, also suitable for the anhydrite process, having a corresponding capacity. The volume of the decomposition vessels, per thousand kgms. production of P_2O_5 per 24 hours, is small, and corresponds to 3–5 cubic metres for the dihydrate process, and 4–6 for the anhydrite process, according to the quality of phosphate rock used.

Again, for the production of phosphoric acid that does not aim at higher concentrations than can be reached in the dihydrate process, as for example, phosphoric acid to be used for the production of sodium and ammonium compounds, the process now described combines simplicity of design and cheapness of operation that can scarcely be excelled.

* * *

The investigatory work affecting the production of phosphoric acid from the decomposition of phosphate rock with sulphuric acid, that began in 1926, by Nordengren and his collaborators, has now been consummated, after a period of ten years. Theoretical assumptions have been thoroughly investigated, and practical methods of working have taken definite forms. The technical possibilities that have been developed are the following:—

1. Anhydrite Process: direct production of phosphoric acid containing 40–45 per cent. P_2O_5 , in open vessels, with heating. Application: enrichment of superphosphate, production of salts, etc.
2. Anhydrite process with concentration of product to more than 50 per cent. P_2O_5 . Application: double and triple superphosphates, enrichment of superphosphates, etc.
3. Dihydrate process: direct production of phosphoric acid containing 25–30 per cent. P_2O_5 , in open vessels, without heating. Application: phosphoric acid salts, phosphate of ammonia. Enrichment of superphosphate.

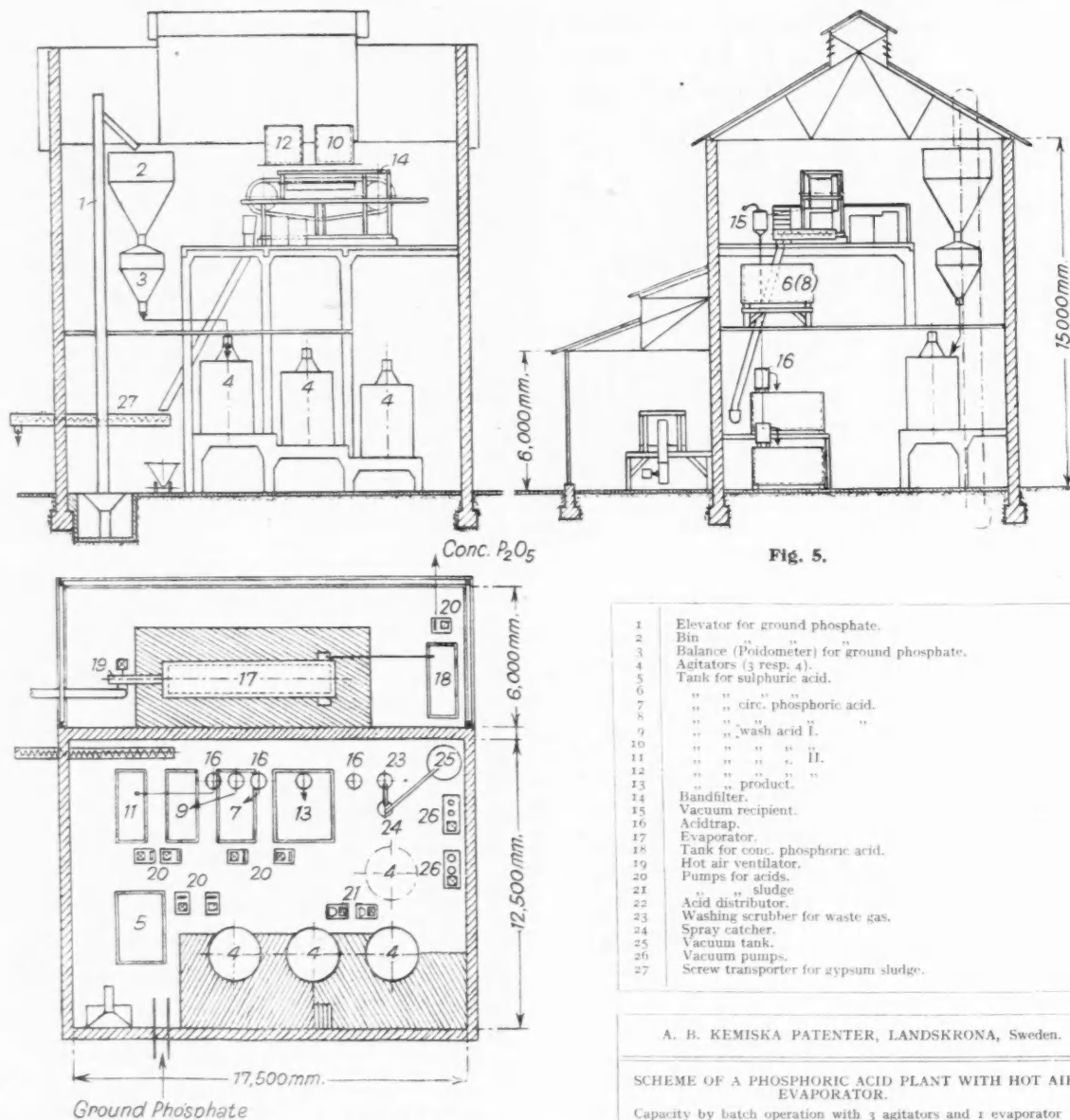


Fig. 5.

- 1 Elevator for ground phosphate.
- 2 Bin
- 3 Balance (Poidometer) for ground phosphate.
- 4 Agitators (3 resp. 4).
- 5 Tank for sulphuric acid.
- 6 " " circ. phosphoric acid.
- 7 " " wash acid I.
- 8 " " wash acid II.
- 9 " " product.
- 10 Bandfilter.
- 11 Vacuum recipient.
- 12 Acid trap.
- 13 Evaporator.
- 14 Tank for conc. phosphoric acid.
- 15 Hot air ventilator.
- 16 Pumps for acids.
- 17 " " sludge
- 18 Acid distributor.
- 19 Washing scrubber for waste gas.
- 20 Spray catcher.
- 21 Vacuum tank.
- 22 Vacuum pumps.
- 23 Screw transporter for gypsum sludge.

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SCHEME OF A PHOSPHORIC ACID PLANT WITH HOT AIR EVAPORATOR.

Capacity by batch operation with 3 agitators and 1 evaporator unit 5 tons P_2O_5 in 24 H. as 50 per cent. solution.
Capacity by continuous operation with 4 agitators and 2 evaporator units 10 tons P_2O_5 in 24 H. as 50 per cent. solution.

4. Dihydrate process with concentration of product to more than 50 per cent. P_2O_5 . Application: double and triple superphosphates. Enrichment of superphosphates, etc.

According to circumstances, one or other alternative should be preferred. All alternatives can be worked continuously or intermittently, according to the size of the plant. The installation would in all cases be relatively simple, and contrasted with older decantation plants, will not involve anything approaching the original installation costs, and will occupy only a fraction of the space formerly necessary. The plant can be put out of action at will, and can be restarted in a very short time, as only comparatively small amounts of acids and sludge are circulating, or are present.

The essential conditions that admit of the production of technical phosphoric acid are (a) that calcium sulphate must be in a form allowing of easy filtration; and (b) the filter must be so constructed that it is possible to separate the acid economically, without unnecessary dilution occurring. These conditions, as has been remarked, have been attained, and it is now possible to produce phosphoric acid of high concentration, so cheaply—at least, in larger plants—that double or triple superphosphate can be manufactured at such prices, per

unit of P_2O_5 , as to approach very nearly that of the unit price of P_2O_5 in superphosphate. Moreover, the slightly higher cost can practically be disregarded, in view of the lower costs of transportation and packing.

Metric System in Industry

A DETAILED examination of the use of the metric system and its further possibilities in the chemical industry is announced by the Decimal Association. It is pointed out that the metric system is already in use in part in a number of industries, and that the association would welcome the co-operation of any firms willing to supply information as to the application of the system in their own concerns. By such co-operation it is hoped to compile a comprehensive survey to be used in the association's efforts to secure decimal reform for Great Britain. The Decimal Association is now keenly supported by over 600 industrial concerns including a number in the chemical industry.

Letters to the Editor

Oil Production Costs

SIR,—The following description of the process which was referred to in my letter, published in THE CHEMICAL AGE of October 9, may be of interest:

The material to be treated is reduced to a degree of fineness to pass through a screen of 1/16 in. mesh. This crushing and disintegrating costs below 2d. per ton, including labour and upkeep. The material in the fine state is automatically fed into an eight-chambered apparatus, termed the transformer, at the rate of approximately 2 tons per hour or 50 tons per day. The chambers are superimposed and maintained at fixed temperatures, predetermined for the material under treatment and the products required. Three chambers for liquid refining are also superimposed.

The crushed material is automatically fed into the top chamber for solids where it is heated by externally applied heat to the temperature necessary to expel the water. The temperature in this first chamber is maintained as high as possible without reaction upon the hydrocarbon—approximately from 250° to 300° F. according to the material. In this No. 1 chamber the material is moved across a revolving table by fixed ploughs which turn the shale or coal over so that each particle is presented to the heat of the chamber directly, without being shrouded by other layers of carbon. Upon reaching the periphery of the table the material falls by gravity to the floor of the chamber where it is moved by ploughs in the same manner toward the centre where it drops through a seal into the chamber below.

This chamber, No. 2, is maintained at a temperature from 100° to 150° F. above No. 1. If any material has depolymerised in Chamber No. 1, it is distilled and a further depolymerisation of the solid hydrocarbons occurs in No. 2. The distilled vapours are condensed in a recycling condenser and conducted into chamber No. 1 where they are again distilled and pass through a recycling condenser into the lowest of the refining chambers. These refining chambers (three in number) simply distil and recycle the liquid furnished them until the top refining chamber is reached from which the spirit is condensed ready for the market.

The action of the chambers below Nos. 1 and 2 is the same. Each chamber into which the material descends is maintained at a higher temperature than the preceding one. Thus the solid material is gradually transformed from the solid insoluble state into the liquid soluble form, and the liquids distilled away prior to the transformation of any solids requiring a higher temperature for depolymerisation.

During the entire process the gases which do not condense are cleaned, activated and brought back to the chambers to act as scavenging agent to force the vapours out of the reacting chambers into the recycling condensers, thus allowing no lag when the vapours are formed. The gas being in an activated state and in contact with a heavier hydrocarbon in which the molecule is widely expanded, tends to unite with the molecule, forming lower boiling-point oils and increasing the yield.

The entire operation is automatic and continuous and the apparatus is constructed in 50 tons-per 24 hours units. A 5-unit plant can be manipulated by two men per shift of eight hours with two extra hands on each day shift, and one superintendent. The cost of throughput in a 250-ton plant will be below one shilling per ton, so with coal delivered to plant at ten shillings per ton and allowing one shilling throughput cost and a 30-gallon yield, the cost of production would be 4.4d. per gallon.

With many of the coals tested by the process, yields have been from 50 to 111 gallons per ton, so I estimate that 2d. per Imperial gallon may be taken as the average cost of motor spirit, kerosene and Diesel oil.

There are several points in the letter of Messrs. W. H. Ormandy and A. J. V. Underwood in your issue of October 23, which appear very misleading.

The Australian is concerned solely with Australian values, and when he must obtain plant, etc., from abroad, he must bear the difference of exchange. If he buys in England, instead of his £100 equalling £100, it will only equal £80. What a plant erected in England will cost does not interest the Australian; he must think in terms of Australian money. The report of the Commonwealth Hydrogenation Committee was made not for the English public but the Australian, so the suggestion of a 20 per cent. reduction to conform to sterling is unsound.

The quarrel appears to be with the findings of the Commonwealth Committee. As their work was complete upon the evidence at hand, any improvements which have been made since the report or that are going to be made in the immediate or far distant future can have no bearing on that report.

A plant producing 150,000 tons of oil per year must necessarily be composed of several units of production and so must a plant turning out 30,000 tons of oil per year. Consequently the argument *re* unfairness in comparison of capital costs per ton of oil is not well founded.

In the last paragraph it is stated that the Fischer-Tropsch process and the hydrogenation process are processes "for the complete conversion of coal into oil." Nothing could be further from the truth. No process exists to convert coal into oil *completely*; no process can be designed to convert coal into oil *completely*. A complete conversion can mean only one thing—2,240 lb. of coal = 2,240 lb. of oil.

How long must the public suffer from these loose statements which are so grossly misleading?—Yours faithfully,

NAT H. FREEMAN.

7 Baldwin's Gardens,

Gray's Inn Road, London, E.C.1.

Proposed Supplemental Charter of the Institute of Chemistry

SIR,—Referring to the letters of Messrs. A. J. Baker and Edward Milligan in your issue of October 23, I would draw attention to the fact that the Institute of Chemistry was in touch with the Universities at least as early as the year 1900. As regards recent years, the Register for 1926 shows that of 47 officers and councillors, 34 were University graduates, eight being University professors, and a further five lecturers in Universities or at technical and other colleges of importance. Of 389 fellows and associates taken at random, 290—approximately 75 per cent.—were University graduates, the remainder including Associates of the Royal Colleges of Science of England and Ireland, City and Guilds, Royal Technical College of Glasgow and other leading technical colleges.

The 1936 Register shows, of 49 officers and councillors, 13, or about 26 per cent., professors, seven more lecturers, etc.—about 14 per cent.—and in all 45 graduates. Of 427 fellows and associates taken at random, 337—about 79 per cent.—were graduates, the remainder as before.

Clearly, then, it is not a case of the Institute suddenly becoming "University-conscious," but of Universities gradually becoming more Institute-conscious.

The primary function of an University is the *training* of students, an important proportion of whom continue at academic pursuits; the primary function of the Institute is to certify *professional* competence, which is quite another matter.

Again, it is quite largely due to steady pressure exerted by the Institute over a long period that the recently qualified chemist is no longer expected to accept a salary of 30s. per week as works manager, or to start as an assistant at £1 per week or less. This is not a joke—far from it.

The evident desire of your above-named correspondents, to dance with both feet and heavy boots upon the prostrate carcass of the Institute, indicates to me the necessity for

pressing on with further unification of the profession through the projected Chemistry House, under which scheme there would be less excuse than ever for bitter detraction by minorities of other bodies, each of which has its own field of useful work.

True, as has been pointed out, this would mean an increased subscription for the members, but the young chemist is to-day so much better paid that the advantages to be gained would be well worth the extra sum.—Yours faithfully,

"B.Sc., A.I.C."

Herts.

SIR,—As a member of both the Institute of Chemistry and the British Association of Chemists may I voice my appreciation of Mr. Dee's timely letter, published in your issue of October 16.

That the professional and economic interests of chemists should be in the hands of two separate societies emphasises the chaotic and weak conditions of an unorganised profession. Few industrial chemists take a real interest in their professional associations leaving the control in the hands of members from the universities or research establishments—thus getting the type of organisation their neglect deserves. The industrial chemist, would he only recognise it, can get the type of organisation best suited to his professional and economic needs. Mr. Dee's letter offers a solution.

Let chemists insist that these suggestions have fair consideration.—Yours faithfully,

JOHN ALLAN, B.Sc., A.I.C.

Roseneath,, Windley Crescent, Derby.

In a further letter to the Registrar of the Institute of Chemistry, dated October 20, Mr. T. P. Dee made the following points:—

1. It is most important that the profession be far more united and more fully organised than at present before the next national emergency, whether it be a war (which heaven forbid!) or a trade depression.

2. That it is all to the good that the Chemical Society, the Society of Chemical Industry and the Institute are co-operating through the Chemical Council, but that it is necessary that the British Association of Chemists be brought into the "family group." This object might best be achieved by forming some such elastic bonds between the Institute and the B.A.C. as I propose.

3. That the time when the Institute is proposing to give the Universities special representation on its Council is a *very opportune* time to bring in special representatives of the industrial chemists, by inviting nominations from the Association which exists mainly for the benefit of the industrial chemist.

Chemical Trade with Belgium

Increasing Exports to the United Kingdom

ACCORDING to a report on "Economic and Commercial Conditions in Belgium, June, 1937," published for the Department of Overseas Trade (Stationery Office, 2s. 2d. post free), Belgium's total volume of foreign trade increased from 50,890,000 metric tons, valued at 33,572,000,000 francs in 1935 to 54,700,000 metric tons, worth 41,450,000,000 francs in 1936. In comparing these figures, however, it should be borne in mind that a 28 per cent. devaluation of the franc took place in March, 1935, so an exact comparison is difficult. The striking fact about the external trade during 1936 has been the relatively small increase compared with the internal recovery of the country. Analysed quantitatively, it will be seen that increases in imports and exports amounted respectively to some 9 per cent. and 7½ per cent. of the 1935 figures.

A striking increase occurred in the value of imports from the United Kingdom, although a reduction took place in actual quantity. Belgian exports to the United Kingdom increased in both quantity and value. As regards exports to the United Kingdom, increases in value occurred under the following headings:—live animals and animal products, vegetable products, chemical products, textile, stone, and metal and metal goods. Imports from the United Kingdom by weight were doubled and increased in value by 43 per cent.; exports to the United Kingdom decreased in weight by 24 per cent. but increased 8 per cent. in value. There has thus been a striking change in the tendencies observed from a comparison of the year 1936 with the previous year. The broad outlook for United Kingdom trade with Belgium therefore justifies considerable optimism, provided restrictions to trade are not increased.

The Belgian trade in pharmaceutical specialities has shown progress during 1936, although imports from the United Kingdom of this class of goods decreased in both quantity and value as compared with 1935. In 1935 there were 139.8 metric tons valued at 5,269,000 francs; in 1936, 120.5 metric tons valued at 4,807,000 francs. This decrease may be accounted for by the fact that more of the actual processing of such goods and, in most cases, all of the packing is now done in Belgium. It is probably true nevertheless that the sale of specialities of

United Kingdom proprietary makes has increased. Optimism expressed in the report for 1935 on the prospects of the trade in perfumery and toilet preparations has been justified by the results for 1936. Further improvement during 1937 is indicated by the improved business reported for the first two months of the year.

Generally speaking, the results for 1936 in respect of the chemical industry were satisfactory. Production increased and prices remained fairly constant in spite of the prevailing tendency towards rising prices, and increasing costs of raw materials. The devaluation of the "gold bloc" currencies in the autumn of 1936 increased the competition on the Belgian market from the products of the countries concerned.

In respect of chemical products values of exports and imports were as follows:—

		All Countries.		United Kingdom.	
		(million francs)		(million francs)	
		1935	1936	1935	1936
Imports	...	750	834	42	44
Exports	...	1076	1287	116	123

The manufacture of nitrogenous fertilisers during 1936 continued its recovery from the critical position into which it had lapsed during the last few years. This industry is comparatively young, having grown up between 1927 and 1929; nevertheless its estimated annual productive capacity is now 190,000 tons. The productive capacity for nitrogenous fertiliser obtained from nitric acid amounts to 25,000 tons, equivalent to 200,000 tons of acid annually; but the production of the latter is not thought to exceed 70,000 tons annually. Thus the productive capacity of the industry is greatly in excess of the combined outlets available on the home market and abroad. The production of ammonium sulphate is estimated at between 270,000 and 300,000 tons annually.

The consumption of pigments during 1936 was very much lower than in normal years; users of industrial blues carried on throughout the year with stocks on hand. A marked change took place, however, at the beginning of 1937, and suppliers of industrial ultramarine report greatly increased orders for consumption.

Special Steels in the Chemical Industry

By

T. ROBERTS (Director, Special Steels Information Bureau, the Brymbo Steel Co., Ltd.)

It is perhaps not generally realised by chemists who rarely find time to keep fully abreast with all the developments in the many branches of their own science, that tremendous advances have been made in recent years in the composition and properties of steels. At one time steel was simply a mixture of iron and carbon in varying proportions with small quantities of other elements such as manganese, sulphur and phosphorus whose presence was often adventitious and sometimes undesirable. Nowadays, however, there are almost countless varieties of steel and in each of these the additions are intentional and most accurately controlled. The classification of steels according to their properties or compositions is by no means simple, but for ordinary purposes three classes might be considered. These are, straight carbon steels in which small quantities of other elements may be present, special steels containing elements added in small amount to impart definite qualities, and special alloy steels in which the additions may amount to over 30 per cent. It is the latter class of steel which is of the greatest interest to the chemist and chemical engineer at present, but the second class, the special steels, may play a great part in future developments. Since special alloy steels are so important in chemical industry it is intended to deal with them first before making brief mention of special steels.

Stainless Steels and Irons

Stainless steel, so long the dream of the engineer is now almost commonplace, but there does not seem to be a general realisation that there are a great number of steels and irons which can be classified as rustless. The common feature of all these steels and irons is a high proportion of chromium or nickel or both, but in the rustless irons the percentage of carbon is lower than in the steels and this makes them generally more easily machinable. In this article it is not intended to indicate all the types and uses of rustless steels and irons, but rather to indicate briefly the conditions for corrosion resistance in general.

In order to understand fully the difference produced in steels by the addition of chromium or nickel it is necessary to have a slight idea of the different structures of ordinary or straight carbon steel. Pure iron, ferrite, can exist in two solid forms; body centred cubes above 1,400° C. which change to face-centred cubes below this temperature and revert to the body-centred variety at about 900° C. The carbon in steel forms with the iron a carbide, cementite, but may sometimes be present as graphite. When steel is heated the carbide starts to pass into solid solution in the iron. A solid solution of carbide in iron is known as austenite and in straight carbon steels can exist only at high temperatures. The exact temperature at which a steel is all in the austenitic condition depends on the proportion of carbon present. A steel with 0.80 per cent. carbon is entirely austenitic above 700° C.

Rate of Cooling

When this steel is cooled below 700° C. the carbide begins to come out of solution and the final character of the steel at ordinary temperatures depends on the rate of cooling. Slow cooling produces a mixture of ferrite and cementite arranged in the form of alternate plates. This form is known as pearlite. Rapid cooling brings the carbide out of solution much more quickly and thus produces smaller crystals almost molecular in size. Steel in this form is a close grained mixture of cementite and ferrite and is known as martensite. Intermediate states between pearlite and martensite are sorbite and troostite and even finer distinctions can be drawn from microscopic examination so that the condition of some steels is referred to as troosto-martensitic. These differences in micro-structure have a tremendous effect on the properties

of steels. Ferrite is soft and ductile, austenite does not exist at ordinary temperatures with straight carbon steels, pearlite is harder than ferrite but less ductile, while martensite is still harder and correspondingly less ductile.

The exact condition in which it is desirable that a steel should exist depends on the purpose for which it is required. Steel parts which require machining should obviously be made from a soft steel which is easily cut and then after they have been fabricated the steel can be suitably heat-treated to produce pearlite or martensite if resistance to abrasion is wanted. This more or less theoretical discussion of steels may seem to have little bearing on special alloy steels, but it is necessary that the different structures of straight carbon steels should be understood before the effect of the addition of chromium can be explained.

Chromium is soluble in iron and in order that a steel or iron should have rust resisting properties it is essential that there should be more than 11 per cent. of chromium in solid solution. This does not mean that an alloy steel containing 11 per cent. of chromium will be rustless as the effect of the carbon in the steel must be considered. As explained before, this carbon is present as a carbide which may or may not be entirely in solid solution in the iron. If the carbon is not entirely in solution as carbide in a special alloy steel, then it will bring out of solution a considerable amount of the chromium. Therefore for a rustless steel or iron, that is, one resistant to oxidation, it is necessary that the carbon should be all in solid solution as carbide—austenitic condition—or that there should be sufficient excess chromium in the alloy to allow 11 per cent. to remain in solid solution irrespective of what has been removed by the carbon. Thus alloys containing a 0.10 per cent. of carbon and 12-14 per cent. of chromium are rustless and belong to the class of rustless irons which are more easily machined than the stainless steels.

Effect of Heat Treatment

The heat treatment to which these irons are subjected alters their final characteristics as regards hardness, but does not alter their rust resisting properties. Austenite is formed by heating to 800° C. though all the carbide does not dissolve at this temperature since the carbide in chromium alloy steels and irons does not dissolve so readily as it does in straight carbon steels, and temperatures up to 1,000° C. are required for complete solution. On quenching a 12-14 per cent. chromium iron in water martensite is formed and when this is tempered at 750° C. ferrite and carbide result. In this process practically all the carbide is thrown out of solution but sufficient chromium remains to impart good oxidation resisting properties. An alloy containing about 0.30 per cent. of carbon and 12-14 per cent. of chromium is regarded as a stainless steel and on heat treating 800-1,000° C. austenite is produced which changes to martensite on quenching in water. Tempering at 450° C. gives a mixed troosto-martensite with but little carbide precipitation. Higher percentages of chromium up to about 30 per cent. impart still greater resistance to corrosion in rustless irons and steels.

A general distinction may be drawn between rustless irons and steels by considering those alloys containing 0.10-0.15 per cent. carbon as irons, while steels may contain up to 1.0 per cent. carbon. In chemical industry chromium alloy steels are not extensively used as they have been replaced by chromium nickel or nickel chromium alloys. In some cases, however, chromium alloys are particularly useful, as the alloy containing 28 per cent. of chromium has very good resistance to scaling at temperatures of about 1,000° C.

The addition of nickel to chromium alloy steels has a very marked effect. If sufficient nickel is added chromium nickel steels can be made which are austenitic at ordinary tempera-

tures, that is, all the carbide is in solid solution. The best known steel of this type is the alloy 18-8 containing 18 per cent. chromium, 8 per cent. nickel and approximately 0.10 per cent. carbon. When cooled from 1,150° C. this steel remains wholly in the austenitic condition and has greater resistance to a wider variety of corrosive agents than chromium alloy steels. Nickel alloy steels containing up to 36 per cent. of nickel have been produced, and nickel chromium steels containing a greater percentage of nickel than chromium are among those most useful in chemical industry. In talking of chromium nickel or nickel chromium alloy steels it must be remembered that a great number of alloys have been made with the addition of small amounts of other elements such as tungsten, silicon, manganese, copper and molybdenum and each addition makes the steel particularly useful for some specific purpose.

Corrosion Resistance

In a short article it is exceedingly difficult to enumerate all the varieties of stainless steels and to indicate their resistance to a particular set of conditions. For example, resistance to common acids depends not only on the steel, but on the concentration and temperature of the acid. No stainless steel is absolutely resistant to all concentrations of sulphuric acid. The common 18-8 alloy is only resistant to cold very dilute sulphuric acid, but other alloys containing copper show considerable resistance to boiling 25 per cent. acid. Molybdenum adds considerable resistance to chromium nickel alloy steels against cold dilute hydrochloric acid, but the resistance against boiling acid is poor. Chromium irons offer particularly good resistance to pure nitric acid provided the chromium content is over 16 per cent. Austenitic nickel chromium alloys with approximately 16 per cent. chromium are also particularly good against attack by nitric acid. The presence of impurities in nitric acid, particularly hydrochloric acid or chlorides reduces the resistance to attack of chromium or chromium nickel steels. This resistance to corrosion is only one property demanded of stainless steels when used in chemical industry. In addition the steels must often be easily machinable and have great mechanical strength. The 16-20 per cent. chromium irons are easily machined, but are soft and are not very useful for resistance against corrosion accompanied by abrasion, whereas 10-18 per cent. chromium high carbon steels are hard but not easily machined.

Heat Resistance

A great amount of metallurgical research has been devoted recently to the production of heat resisting steels, and this, of course, means, in the majority of cases, the production of steel resistant to oxidation at high temperature. In this case the mechanical strength of a steel is of as much importance as resistance to scaling. It will be remembered that, in the earlier portion of this article, attention was drawn to the changes which take place in the microstructure of straight carbon steels when they are heated, and it was shown how different types exist at different temperatures. This change which may take place on heating a steel is a factor which must be carefully considered in producing a steel for resistance to high temperature. A steel of the following composition:

C	Si	Mn	Cr	Ni	W
0.25	1.29	0.57	21.6	7.65	3.15

has excellent resistance to scaling for a temperature range up to 850° C., but above this temperature scaling, under furnace conditions, takes place fairly rapidly. An increase in the percentage of chromium and a decrease in the nickel and tungsten contents increases the resistance of the alloy to scaling at temperatures above 850° C. Even slight differences in the composition of a steel have a marked effect on the resistance to scaling. A chromium steel containing about 28 per cent. of chromium and 4 per cent. each of aluminium and tungsten, but no nickel, has excellent resistance to scaling. This steel has, however, the defect of being difficult

to machine. It will thus be seen that it is very difficult to obtain all the desired qualities in one steel and a compromise must often be made.

More and more use is being made nowadays of welded joints in chemical plant, particularly in vessels designed to resist corrosion. A welded joint has the great advantage over riveting in that true butt joints can be made by welding, and there are no crevices in which corrosive materials can lodge and set up local action. Stainless steels as a class present no particular difficulties to the welder, but where these steels are intended to resist corrosion care must be exercised in the selection of the right type. Some stainless steels after being welded are particularly susceptible to corrosion at the welded joints owing to conditions being set up by the local heating during welding. The common 18-8 alloy undergoes a change on being heated to temperatures between 500 and 900° C., whereby it becomes much more liable to attack by corrosive action, especially by oxidising agents. Sometimes steel of this type after having been heated as indicated crumbles to pieces under the action of even mild corrosive agents. This phenomenon seems to be connected with the separation of chromium carbide. This defect can be overcome by heating the alloy which has been subjected to a temperature between 500 and 900° C. to a higher temperature, over 1,000° C., and cooling rapidly. This decrease in corrosion resistance may occur on both sides of a welded joint where the metal may have been subjected to the harmful range of temperature. The liability to weld decay of 18-8 alloy steel can to some extent be overcome by the addition of a small amount of vanadium.

Space is not available to mention all the applications of rustless irons and steels in chemical industry, but sufficient will have been shown to make it clear that corrosion resistance *per se* is not always sufficient to render a steel useful in chemical industry.

Special Steels

Special steels in which the amounts of added elements are comparatively small have not, so far, been developed exclusively for any particular purpose in chemical industry, but future developments may result in the production of special steels with good heat resisting properties. At present manganese steels containing from 0.10 to 0.55 per cent. carbon and 1.0 to 1.9 per cent. manganese are being used for case-hardened parts such as roller bearings, cam shafts and gears. As in the case of the special alloy steels the manganese steels can be obtained in the austenitic condition at ordinary temperatures by carefully controlling the addition of manganese. A steel containing between 11 and 14 per cent. of manganese is austenitic, and is widely used where a hard wearing steel is required. A very remarkable development in this class of special steels has been the introduction of silicon steels for use in the electrical industry. High silicon steels in which the percentage of silicon may reach 4 per cent. are used to make transformer core sheets. The action of the silicon in this class of steel seems to be to cause the carbon to precipitate as graphite and in addition silicon increases grain growth. Both these factors have a pronounced effect in reducing hysteresis loss. As in special alloy steels copper has the effect of increasing resistance to corrosion. In steels of this type the amount of copper usually added is between 0.20 and 0.50 per cent., and the rust resisting properties may be still further increased by the addition of 0.05 to 0.10 per cent. of molybdenum. Such steels which are low in carbon are by no means rustless steels, but are very widely used for the production of corrugated sheets and steel buildings.

This brief mention of only a few of the special steels at present developed shows that even in low alloy steels the effect of added elements is great and it is felt that by the continued development of this type, steels which are resistant to high temperature will be produced at a price much below that of the special alloy steels of high chromium and nickel content. Such a development will be of immeasurable advantage to the chemical industry.

Synthesis of Gaseous Hydrocarbons at High Pressure

Research Report of the Institution of Gas Engineers and Leeds University*

THE experiments discussed in the report continue the investigation of processes of gasification for the production of gas suitable for general distribution. The first part of the investigation, described in the 39th Report of the Joint Research Committee (Inst. Gas Eng. Communication No. 141, 1936) dealt with gasification in steam with oxygen and gave encouraging results. The experiments with oxygen were carried out at atmospheric pressure and, according mainly to the relative amounts of steam and oxygen supplied, the gas made consisted of varying proportions of hydrogen and carbon monoxide with some carbon dioxide. The results refer directly to the use of oxygen for the production of such gases, but they were primarily obtained for application to town gas manufacture with the view that gasification would be followed by a synthesis of gaseous hydrocarbons to yield a final gas of composition and calorific value more suitable for distribution. This report is concerned with the synthesis of the hydrocarbons and especially with the possibility of promoting the synthesis by operating at high pressure.

Methane Formation

The first high pressure experiments were made within conditions anticipated for a fuel bed undergoing gasification and were designed to see whether a synthesis of hydrocarbons could be expected to occur in the upper part of the bed to the same extent when using British coals as in the Lurgi process using lignite. Thus, a mixture of hydrogen, carbon monoxide, carbon dioxide and undecomposed steam, such as would be produced near the base of the fuel bed by the initial gasification reactions, was passed at 50 atmospheres pressure over various cokes heated to 800° C. The gas mixture was supplied at a rate equivalent to the gas output of a modern water gas plant and the cokes were made from lignite, semi-anthracite, and weakly caking and strongly caking coal. It was found that after treatment the gas had a considerable methane content which was not greatly dependent upon the type of coke so long as this had not suffered severe heat treatment during its preparation. In particular, the lignite coke did not appear to be specially favourable for methane formation.

The coals were converted to cokes before use in order to avoid any fusion of the charge in the reaction tube and consequent interference of gas flow. Methods for overcoming the difficulties likely to arise when gasifying caking fuels are receiving attention, but apart from these difficulties, the results of the preliminary experiments indicate that all types of bituminous coals, as well as lignite, can be gasified in steam under pressure with the synthesis of hydrocarbons in the fuel bed and the production of gas of a sufficiently high calorific value for general supply.

The investigation then entered a wider field. There were indications that most of the methane formed in the preliminary experiments was the product of direct combination of the coke with the hydrogen contained in the mixture of gases supplied and was not due to interaction of hydrogen and carbon monoxide. The hydrogenation of solid fuels to gaseous hydrocarbons plainly required a thorough investigation.

The experimental procedure adopted was to heat various types of fuel to 800° C. in a stream of hydrogen, or gas containing hydrogen, at pressures between 1 and 100 atmospheres. The formation of gaseous hydrocarbons was ob-

served during both the heating-up period and a period at 800° C. The fuels were also heated in nitrogen for comparative purposes. 1½ to 2¼ hours were taken in heating to 800° C. and this temperature was then maintained for a further 1½ hours. Results, obtained with a coke prepared at 450° to 500° C. from a strongly caking Yorkshire coal, can be taken as typical. When this coke was heated in nitrogen at atmospheric pressure it evolved hydrogen and methane along with smaller quantities of ethane, unsaturated hydrocarbons, carbon monoxide and carbon dioxide. When heated in hydrogen at atmospheric pressure the coke evolved less hydrogen and considerably more methane was obtained. The greater yield of hydrocarbons was plainly the result of the coke being hydrogenated, even at atmospheric pressure, and up to 650° C. there was an absorption of the hydrogen supplied.

The most striking results were obtained, however, by heating the coke in hydrogen at pressures above atmospheric. Hydrogenation became much more pronounced and there were remarkably high yields of gaseous hydrocarbons. At 5 atmospheres the yield was equivalent to 92.1 therms per ton, at 10 atmospheres 132.9 therms, at 25 atmospheres 202.5 therms, at 50 atmospheres 276.0 therms and at 100 atmospheres 311.2 therms. Moreover, some methane was still being produced when the experiments were stopped, 1½ hours after attaining 800° C. At 50 and 100 atmospheres there was evidence of an increased yield of tar.

The outgoing gas was of high calorific value during the most active periods at the higher pressures. The calorific value of the gas obtained with a given pressure could be varied, however, by modification of the rate of heating the coke or of the rate at which hydrogen was supplied. Thus the gas had a higher calorific value when the rate of heating was increased or the rate of hydrogen supply reduced, although there was an accompanying decrease in the yield of hydrocarbons per ton.

When the coke was heated in hydrocarbon under pressure, the reactions resulted in a marked absorption of the hydrogen supplied. The absorption began with the appearance of methane at about 500° C. and continued until the end of the experiment.

Thermal Instability of the Coke

When the coke was heated in hydrogen at the lower pressures, the hydrogenation reactions proceeded most rapidly at 500° to 550° C., the temperature range in which the coke decomposed with the evolution of methane when heated at atmospheric pressure. In hydrogen at higher pressures, the most rapid hydrogenation occurred at higher temperatures, viz., 700° to 750° C. This range is also related to the thermal decomposition of the coke, since it is at such temperatures that coke is known to undergo a profound change with the development of a denser carbon structure and, normally, a marked liberation of hydrogen. It seems clear that the hydrogenation of coke to gaseous hydrocarbons depends to a considerable extent upon the coke being thermally unstable at the temperature of treatment and that the main function of the hydrogen atmosphere is to modify the course of a decomposition which would in any case take place. Further evidence was obtained in support of this view.

Other fuels treated with hydrogen at high pressures were lignite, semi-anthracite, and cokes from a weakly caking coal. It is remarkable that, although there was some variation in the temperature at which hydrogenation commenced, the widely different types of fuel gave similar yields of gaseous hydrocarbons per ton. At 50 atmospheres the yield from lignite was no higher than that from the cokes of bituminous coals.

* Summary of the report of the Joint Research Committee of the Institution of Gas Engineers and Leeds University to be presented at the Autumn Research Meeting of the Institution on November 2 and 3 (Communication No. 167).

Rumours of Slump

The Stock Exchange an Artificial Market

THE financial journalists have done their best for some weeks to play upon the nerves of the public with tales of slump. Where is the slump? Wall Street is reported to have collapsed. The picture drawn of the London Stock Exchange is one of black Fridays and dismal Mondays. When the reader looks beyond this hysteria and tries to think out the problem for himself, he discovers that gilt-edged stocks in the course of a twelvemonth have gone from a 3 per cent. to a $3\frac{1}{2}$ per cent. basis, and that industrial stocks have adjusted themselves in proportion. But he notices that the public is still expected to invest in industrial equities with a return of about 4 per cent. This so-called slump fails to obey the market rules, for trade is good, employment is high, wages are better, and by all relevant tests the nation is prosperous.

Why then a slump? The facts are not far to seek, and in justice to our readers and other traders who are threatened by the current talk of disaster, the truth should be told. The position to-day is that the Stock Exchange is an artificial market dominated by an artificial Government policy. Cheap money has been pumped into it, with the result that the prices of securities of every kind have been inflated and the general level, notwithstanding recent drops, is still well above the natural and normal. This cheap money obsession, for which the Treasury is entirely responsible, is put forward as a blessing to trade. The politicians have a way of bolstering up their arguments by feeling references to their solicitude for commerce and industry. This theory is, however, completely deceptive. Money is being kept cheap by artificial means, not for the purpose of helping trade, but for that of enabling the Government to borrow cheaply.

Accordingly, the business community, instead of weeping over the much-advertised woes of the stock market, should rejoice that natural forces are defeating political manoeuvres. What is happening is that artificial money management is proving abortive, and that the Stock Exchange, considered as a market, is beginning to price the goods it has to sell at levels which have more relation to the views of the buyers or investors than to those of the bureaucrats who still want more money to waste. The dangerous position which Whitehall is arrogating to itself is again emphasised by a letter to *The Times* from an alderman of the Cheshire County Council. He says bluntly that the schemes carefully drawn up by County Councils are subject to dictation from Whitehall, which invariably takes the form of a demand for more expensive schemes. An all-round curb on bureaucratic activity was never more desirable.

United States Lime Industry

Statistics for 1936

LIME sold or used by producers in the United States in 1936 amounted to 3,749,383 short tons, valued at \$26,933,719, according to figures compiled by the United States Bureau of Mines. This represents an increase of 26 per cent. in quantity and 24 per cent. in value compared with 1935. Sales of hydrated lime, which are included in the above totals, amounted to 1,225,829 tons, valued at \$9,529,743, an increase of 22 per cent. in quantity and 20 per cent. in value.

Sales of lime for agricultural uses—336,995 tons—increased 19 per cent.; sales for construction—891,267 tons—increased 36 per cent.; dead-burned dolomite for furnace refractories—596,751 tons—advanced 31 per cent. A 26 per cent. increase in shipments of metallurgical lime (572,574 tons) was partly attributable to greater steel-making activity. Chemical lime, of which the paper industry is a large consumer, increased 21 per cent. Improvement likewise occurred in most of the miscellaneous consuming outlets, including water purification plants, tanneries, glass works, and chemical works.

Funeral of Lord Rutherford

Distinguished Scientists at Westminster Abbey Service

LORD RUTHERFORD of Nelson was buried in Westminster Abbey on Monday, near the graves of Faraday, Kelvin, Darwin and Huxley. At the funeral service, the King was represented by Lord Fortescue, the Prime Minister by Mr. G. P. Humphreys-Davies, and the Lord Chancellor by Mr. Vernon Harrington. On either side of the coffin, as pall bearers, walked the High Commissioner for New Zealand, Professor H. R. Dean (Vice-Chancellor of Cambridge University), Lord Dawson of Penn (President of the Royal College of Physicians), Sir William Bragg, O.M. (President of the Royal Society), Sir Edward Poulton (President of the British Association), Professor A. S. Eve (McGill University), Professor E. D. Adrian (Trinity College, Cambridge), Sir Frank Smith (Department of Scientific and Industrial Research), Professor W. L. Bragg (Manchester University), and Sir George Lee (President of the Institution of Electrical Engineers).

People distinguished in science, industry, law and government filled the centre of the Abbey. Among them were: Dr. E. F. Armstrong, Sir Percy Ashley, Mr. W. R. Barclay, Professor W. A. Bone, Mr. W. D. K. Brauholtz, Lord Cadman, Dr. C. H. Desch, Professor F. G. Donnan, Sir Martin Forster, Sir Harold Hartley, Professor Sir Frederick Gowland Hopkins, Mr. James Henderson, Dr. R. Lessing, Lord Melchett, Mr. Emile Mond, Sir Robert Mond, Sir Gilbert Morgan, Dr. A. Parker, Professor J. C. Philip, Sir Robert Pickard, Lord Rayleigh, Sir Robert Robertson, Professor R. Robinson, Professor N. V. Sidgwick, Professor J. L. Simonsen and Dr. F. S. Sinnatt.

Function of Chemical Council

Importance of Work Foreseen by Professor T. P. Hilditch at S.C.I. Meeting

AT the opening meeting of the session of the Liverpool section of the Society of Chemical Industry, which took place at Liverpool University on October 22, the chairman, Professor T. P. Hilditch, referred to events which had taken place since the last session, and said that, as his personal opinion, in the Chemical Council the foundations were being laid of the most hopeful and concrete thing that had been done for chemistry in the last few years, during which time a considerable number of schemes for co-operation between the more important chemical bodies had been proposed and had then fallen to the ground. The Chemical Council started in a more modest way, but in the long run he thought it was going to do a great deal for the interests of chemists. Up to the present there was no material benefit attached to it in the sense of reduced subscription rates. It was common knowledge that a large sum had been promised and provided for the use of the Chemical Council, and that money was going to be used in the first place to do some very much needed work in assisting the library of the Chemical Society. From what was heard of the efforts which were being made, he felt that in due course the Council would play a very important part in unifying and co-ordinating the operations of the chemical bodies.

Presentation of Prizes

The chairman then presented the following prizes: Leverhulme Prize—E. Tittenson; Society of Chemical Industry Prizes, presented by the Liverpool Section: Special Merit—D. F. Barratt; Senior: A. R. Fraser; Junior: J. V. Shephard; and welcomed members of the Road and Building Materials Group, with whom the meeting was being jointly held. Professor R. G. Batson read a paper on "Some Problems in Connection with Modern Roads and Road Construction."

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The mercerisation of cellulose wool. K. Heide, *Kunstseide u. Zellwolle*, 19, 314-323.

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Personal Notes

MR. JOHN GALLOWAY CARRUTHERS, of Bearsden, Glasgow, retired chemical merchant, has left personal estate valued at £47,152.

MR. DAVID RAITT, M.A., B.Sc.(hons.), a graduate of St. Andrews University, has joined the scientific staff of the Anglo-Iranian Oil Co., at Abadan.

COLONEL HEREWARD SPROT and MR. SAMUEL TWENTYMAN COULSON have been announced directors of Sadler and Co., Ltd., chemical manufacturers, Middlesbrough, to fill vacancies on the board.

MR. THOMAS MARNS, president of the Pharmaceutical Society of Great Britain, has returned to England following a visit to Canada and the United States. Mr. W. W. GAMBLE, managing director of Allen and Hanburys, Ltd., who has been visiting Canada, has also returned to England.

SIR ARCHIBALD MITCHELSON, Bart., and Messrs. J. STANLEY HOLMES, A. W. HAIG, and C. P. HAILEY have retired from the board of Anglo-Continental Guano Works, Ltd. Messrs. F. G. CLAVERING FISON, P. T. CHEVALLIER, D. J. BIRD, E. J. HESSENBERG, K. A. MITCHELL, W. G. T. PACKARD, and J. R. RAY have been appointed to the board.

MR. E. TITTERSON was presented with the Leverhulme prize by Professor T. P. Hilditch at the meeting of the Liverpool Section of the Society of Chemical Industry on October 22. The Liverpool Section special merit prize was awarded to Mr. D. F. Barratt; senior prize to Mr. A. R. Fraser; and the junior prize to Mr. J. V. Shepherd.

MR. A. P. BEVAN, chairman of Goodlass Wall and Co., Ltd., paint manufacturers, is seeking election on the borough council at Liverpool. Other aspirants in the municipal elections are: DR. J. T. HACKETT, manufacturing chemist, who is one of the retiring councillors for Mersey Wood, Bootle; and Mr. J. R. FER, paint manufacturer, who has been nominated for South Liscard Ward, Wallasey.

MR. A. N. DEY, an internal student of the Imperial College, Royal College of Science, London, has received the degree of D.Sc. in chemistry from the University of London.

MR. WILLIAM CASH has tendered his resignation as chairman and director of the Neuchatel Asphalte Co., Ltd. LIEUT.-COLONEL P. D. IONIDES has been elected to fill the vacancy as chairman, and MR. WILLIAM CASH, jun., has been elected to fill the vacancy on the board.

PROFESSOR E. J. CRANE, of Ohio State University, has been awarded the Chemical Industry medal of the Society of Chemical Industry for 1937. Since 1914 Professor Crane has been editor of "Chemical Abstracts", the medal, bestowed annually for "valuable application of chemical research to industry," goes to him for his work in abstracting technical and scientific papers in all fields of chemical industry. More than 60,000 abstracts are prepared and published annually by a staff at Ohio State under Professor Crane's direction; about one-third of this number relates to chemical patents.

MR. H. SIDNEY SMITH has secured the Samuel Wylie Miller medal, annual award of the American Welding Society presented for meritorious contributions to the science and art of welding. This medal was established in 1927 by the late Samuel Wylie Miller, who was an outstanding figure in the development of welding since its inception. Well known in the acetylene industry both in America and abroad, Mr. Smith has served as president of both the British Acetylene Association and the International Acetylene Association, and has been directly responsible for many important developments in acetylene utilisation. He was born at Newark, in England, and was educated as an electrical engineer at Nottingham University. He was elected president of the International Acetylene Association in 1920 and president of the Compressed Gas Manufacturers Association in 1928.

PROFESSOR WALTER N. HAWORTH (Great Britain), PROFESSOR ALBERT SZENTGYOEGYI (Hungary), and PROFESSOR PAUL KARRER (Zurich), are probable recipients of the 1937 Noble Prizes for medicine and chemistry in respect of their researches in connection with vitamins, according to the Swedish paper *Aftonbladet*. Professor Haworth has been director of the chemistry department at Birmingham University since 1925.

DR. FRANK J. TONE has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1938. The medal is awarded annually for valuable work in applied chemistry and will be presented this year to Dr. Tone for his work in the development of abrasives and refractories. The selection is made by a committee representing the five chemical societies in the United States. The medal will be presented on January 7 at a meeting to be held at The Chemists' Club.

MR. H. A. S. GOTHARD is taking Mr. R. M. Maling and Mr. L. H. Mackay into partnership. His practice as from November 1 will be carried on under the style of Alexander Gothard and Partners, at his present address, 12 Holborn Viaduct, London, E.C.1. For the convenience of Continental friends one of the partners will always be available for consultation, by appointment, at the offices of their representative, Mr. E. R. H. Plaistowe, 11 bis, Rue Volney, Paris, 2 (telephone: Opera 49.09).

OBITUARY

PROFESSOR EBER MIDGLEY, formerly head of the textile department of Bradford Technical College, died in a nursing home at Bradford, on October 23, aged 62 years.

MR. FRANK GASKELL, formerly one of the partners in the firm of Gaskell, Deacon and Co., alkali manufacturers, of Widnes, whose business was subsequently absorbed by the United Alkali Co., has died at Wolverhampton, at the age of 84.

MR. ROBERT PEASE, works manager of Ashmore, Benson, Pease and Co., Ltd., Stockton-on-Tees, died on October 20. He was the son of the late Mr. Edward Lloyd Pease, one of the founders of the company, and resided with his mother, Mrs. Edward Lloyd Pease, at Hurworth Moor, Darlington. Mr. Pease was at business up to a fortnight before his death.

Foreign Chemical Notes

Czechoslovakia

THE SZOLYVA WOOD CARBONISATION CO., of Prague, achieved a profit of 43,000 kronen in the past year.

PRODUCTION OF STAPLE FIBRE will be commenced shortly by the Svit Co., of Batizovce, who are already manufacturing rayon.

Japan

A TRANSPARENT UREA-FORMALDEHYDE RESIN has been put on the market by the Minato Kagaku Kogyo K.K.

THE NEW ANTIMONY FACTORY of the Chugoku Mining Co., at Asahimura (Okayama Province), is now in production with a daily output of 30 tons antimony (75 per cent. purity) from 70 tons of 50 per cent. ore.

France

NEW COMPANIES IN THE CHEMICAL FIELD include: Les Laboratoires Reunis "Anios" S.A. of 6, rue de Messine, Paris (capital 200,000 francs) manufacturers of hygienic products and more specifically of the odour-corrective sold as "Anios." Composés Chimiques et Agricoles of Noisy-le-Sec (Seine) (capital 500,000), chemical manufacturers. Société d'Exploitation Rousseau S.A. of Paris (capital 100,000 francs), manufacturers of gas masks.

From Week to Week

TWO ENTIRELY NEW FINISHES for the textile industry are described in leaflets issued by Skilbeck Brothers, Ltd.

PERRY AND HOPE, LTD., Forth and Clyde Chemical Works, Nitshill, have been admitted to membership of Glasgow Chamber of Commerce.

THE FIRST CONSIGNMENT OF SCOTTISH SUGAR BEET reached the factory at Cupar this week. The factory will be in operation for ten weeks.

FIREMEN WEARING GAS MASKS worked among bursting fire-works at a fire at Crane Fireworks Co.'s factory at Warmley, near Bristol, on October 23. Flames shot sixty feet into the air and there were intermittent explosions from small quantities of gunpowder.

THE SHIPMENTS OF CHINA CLAY AND STONE from Cornwall and Devon during September, amounted to a total of 85,259 tons, compared with 70,403 tons for the previous month of August, and 70,136 tons September, 1936; 61,549 tons September, 1935.

FOUR WORKERS IN THE I.C.I. MUNITIONS FACTORY at Linlithgow were injured by burning on October 20, in a fire which followed an explosion. John Callaghan (33), one of the injured men, succumbed to his injuries in Edinburgh Royal Infirmary.

SEVEN LONDON CLUBS ARE OFFERING HOSPITALITY (and temporary honorary membership) to overseas buyers who are attending the British Industries Fair, from February 21 to March 4. They are the English Speaking Union, Overseas League, Royal Empire Society, Royal Automobile Club, Connaught Club, British Empire Club, and the Forum Club.

OUTPUT OF ARTIFICIAL FIBRES IN ITALY during the first seven months of 1937 totalled 69,166,000 kg. against 54,130,000 kg. in the corresponding period in 1936. Output of ordinary (continuous filament) rayon yarn rose from 23,204,000 kg. to 26,782,000 kg. and "Lanital" (casein rayon) production increased from 95,000 kg. to 770,000 kg.

A MEMORIAL TO THE MEMORY OF GEORGE CLARK, founder and at the time of his death governing director of the North British Steel Works (George Clark) (Sheffield), Ltd., was dedicated in the village church at Newton-on-Trent, Lincolnshire, on October 18. The memorial takes the form of an oak screen separating the tower from the nave of the church.

THE PURIFYING AND DRYING OF WASTE LIME for agricultural purposes, which was pioneered in the North-East of Scotland some years ago by the Culter Paper Mills, is to be taken up by Stoneywood Paper Works next year. Culter Paper Mills have found a large demand for dried lime, and hundreds of tons of it have been supplied to farmers in Aberdeenshire.

OIL AND TAR TESTING APPARATUS forms the subject of a new sectional catalogue (No. 15B, Section X), of Griffin and Tatlock, Ltd. Not only has I.P.T. apparatus been included, but also apparatus prescribed by other official standardising bodies, as well as items of special character. For the great convenience of those wishing to consult the catalogue, the serial designation numbers of the various tests of the official standardising bodies are given.

THE BRITISH ASSOCIATION OF CHEMISTS (London Section) held a concert at Broad Street Station Restaurant on October 22, when, with Mr. G. T. Gurr presiding, "The Entertainers" gave a lively show, described on the programme as being "under-rehearsed and forgotten completely." A record attendance rewarded the artists' efforts and the interval, following an item appropriately "Waste not, want not," provided an excellent opportunity for the chairman to announce the taking of a silver collection in support of the B.A.C. Special Aid Fund.

SPEAKING ON "FILMS IN INDUSTRY" at the re-opening session of the Merseyside Film Institute Society in Liverpool on October 18, Lord Leverhulme, the new president, said that his late father introduced the advertising film into this country as far back as 1890. He explained that after his father had founded Port Sunlight he began extending his business on the Continent, and there met a man who possessed and exploited one of the first cinematograph projectors. He obtained two of the machines and had them transported to London, where films were projected upon a hoarding.

GREAT STRIDES HAVE BEEN MADE IN BRITAIN in the promotion of fashion colours since the advent of the British Colour Council, but the new hosiery and leather book shows a very definite advance on anything that has yet been produced in the way of colour co-ordination and colour presentation. The hosiery and leather colours are for the first time shown together in one volume. The hosiery patterns are slotted into the pages so that they can be moved at will and compared with shoe leathers appearing on any page. A most useful feature in the book is the inclusion of certain starred costume colours faithfully reproduced from the silk and wool cards, which serve the useful purpose of showing, at a glance, the spring costume shades with which hosiery, shoes and gloves will be worn.

THE DIRECTORS OF THE BRANSTON ARTIFICIAL SILK CO., propose to acquire the undertaking and assets of the St. Martin Preserving Co., Ltd., for a sum of £125,000.

LARGE TUNGSTEN DEPOSITS are reported to have been discovered in the mountains near the Uspenskoye Copper Mine, in Kazakhstan, U.S.S.R. The tungsten is contained in quartz crystals.

THE SEPTEMBER ISSUE of the "Microscope Record," published by W. Watson and Sons, Ltd., contains an article on "Preparing and Examining Iron and Steel Specimens," by J. Winning.

A DRAWING OF $4\frac{1}{2}$ PER CENT. first mortgage debenture stock of United Glass Bottle Manufacturers, Ltd., amounting to £16,810, will take place on November 18. Stock drawn for redemption will be repaid at par on January 1, 1938.

THE STAFFORDSHIRE IRON AND STEEL INSTITUTE and members of the Iron and Steel Institute resident in the Birmingham district will hold a joint meeting at Dudley on November 9. Mr. T. G. Bamford, president of the Staffordshire Iron and Steel Institute, will preside. A paper on "Some Experiments on the Influence of Silicon, Phosphorus and Manganese on Nitrogen-Hardening Cast Iron," will be read by Mr. J. E. Hurst.

ELIXIR OF SULPHANILAMIDE, the new medicine for use in cases of *streptococcus* infections, meningitis, and other diseases, has now been the cause of 36 "verified" deaths in the United States. The dangers attendant upon its use were first disclosed by the American Medical Association. The manufacturer of the elixir, which is a proprietary article, are endeavouring to recall large consignments which had gone to various parts of the country, but 700 bottles have still to be traced.

IMPERIAL CHEMICAL INDUSTRIES, LTD., has been commissioned by the Government to erect a factory on its Landore site at Swansea, for the manufacture of munitions. The Government's action is a measure to relieve unemployment which still persists in this area. The I.C.I. works employ about 900 persons, some of whom have been transferred to the I.C.I. works at Smethwick. Swansea is also to have a new magnesium factory, to be built by the Magnesium Corporation.

REPRESENTATIVES FROM TWELVE EUROPEAN COUNTRIES met at the annual sales convention of Henry Wiggin and Co., Ltd., this week. A full programme was arranged for the visitors, and they inspected the company's plants at Birmingham, and also the Clydach refinery of the Mond Nickel Co. A series of discussions took place on the applications of nickel, monel and inconel, the range and scope of the Wiggin chemical salts, the development of depolarised and other anodes, and the work of the Bureau of Information on Nickel.

SO GREAT HAS BEEN THE RESPONSE of farmers to the Government's land fertility scheme that suppliers of lime and slag in all parts of the country are reported to be experiencing difficulty in meeting the demand. Farmers are finding it very hard to get immediate deliveries, particularly of basic slag. The purpose of the scheme is to restore the fertility of the land, by making available lime and basic slag at greatly reduced prices. Occupiers, after buying these materials from one of the 3,000 approved suppliers at normal rates, send certain forms to the Land Fertility Committee, who then contribute 50 per cent. in the case of lime and 25 per cent. in the case of slag.

THE GEIGY COLOUR CO., LTD., have issued a new pattern card (No. 948E) displaying their Tinton Chlorine colours and Tinton colours. This group of colours is characterised by great brightness and purity of shade associated with the highest fastness properties which it is possible to obtain. They are the products chiefly used in the fast dyeing of cotton and satisfy the highest demands of fastness in every respect. On account of their outstanding fastness to alkali boiling and chlorine, the Tinton Chlorine colours are said to be the only practicable dye-stuffs in use for materials woven with coloured effects which are bleached in the piece after weaving, whilst the Tinton colours though rather inferior in fastness to chlorine and boiling nevertheless show very high general fastness properties.

INDUSTRIES IN WHICH NEW CAPITAL OF £2,000,000 will be invested by Imperial Chemical Industries of Australia and New Zealand, Ltd., will be in operation in Victoria and South Australia early in 1939. Work has already begun on the new £1,000,000 plant at Port Adelaide to produce alkali products. Construction is under way at Deer Park, Victoria, of the factory and plant for manufacture of sporting ammunition and commercial high explosives. For the alkali factory on the banks of the Port Adelaide river a lease has been secured over 2,000 acres of adjacent land, all eventually to be flooded with salt water. The first 500 acres have already been inundated. A factory is also to be erected in a farming area near Adelaide for the manufacture of cellulose products. A company with a preliminary capital of about £400,000 has been formed, and plant will be brought from Germany in the early part of next year. There is an abundance of straw for this particular industry.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

COMPOSITIONS OF MATTER containing anti-hygroscopic agents.—Armour and Co. (United States, March 1.) 27345.
MANUFACTURE OF ASBESTOS-CEMENT, ETC.—J. L. Blum. 27671, 27672, 27673.
COLOURING, ETC., OF ASBESTOS FABRICS.—A. E. Bradshaw. 27641.
PRESERVING AGENTS for wood, etc.—Brander Fabwerke Chemische Fabrik Ges. (Germany, Oct. 8, '36.) 27312.
TREATMENT WITH FLUIDS of textile fibres, etc.—J. Brandwood. 27663, 27665.
DRYING OF TEXTILE MATERIALS.—J. Brandwood. 27664.
MANUFACTURE OF ORGANIC COMPOUNDS.—British Celanese, Ltd. (United States, Oct. 29, '36.) 27840.
PRODUCTION OF ARTICLES CONTAINING THERMOPLASTIC MATERIALS. Celluloid Corporation. (United States, Oct. 13, '36.) 27839.
TREATMENT OF PHOSPHATES.—Chemische Studien-Ges. Uniwapo-Ges. (Germany, Dec. 9, '36.) 27196.
SILICYL DERIVATIVES OF ORGANIC COMPOUNDS.—F. J. Cleveland (Bendix Aviation Corporation). 27423.
DISTILLATION OF COAL.—T. M. Davidson. 27278.
MANUFACTURE OF SUSPENSIONS of adhesive material in water.—Distillers Co., Ltd., and P. D. Coppock. 27398.
MANUFACTURE OF ARTIFICIAL NITROGENOUS TEXTILE FIBRES.—G. Donagemma. (Italy, Oct. 12, '36.) 27727.
MANUFACTURE OF ARTIFICIAL NITROGENOUS TEXTILE FIBRES.—G. Donagemma. (Italy, Nov. 9, '36.) 27728.
MANUFACTURE OF ARTIFICIAL NITROGENOUS TEXTILE FIBRES.—G. Donagemma. (Italy, Dec. 19, '36.) 27729.
MANUFACTURE OF ARTIFICIAL NITROGENOUS TEXTILE FIBRES.—G. Donagemma. (Italy, May 13.) 27730.
MANUFACTURE OF ETHYL CHLOROFORM.—E. I. du Pont de Nemours and Co., D. W. Cass, and A. A. Levine. 27429.
MANUFACTURE OF POLYCYCLIC AMIDES.—Fabriques de Produits de Chimie Organique de Laire. (France, Oct. 12, '36.) 27725.
MANUFACTURE OF POLYCYCLIC AMIDES.—Fabriques de Produits de Chimie Organique de Laire. (France, July 19.) (Cognate with 27725.) 27726.
MANUFACTURE, ETC., OF TEXTILE FABRICS.—D. Finlayson, T. Dee, and E. L. Greenwood. 27685.
SEPARATION OF HEAVY FROM LIGHT CONSTITUENTS in fluid suspensions.—H. Freeman. (United States, Nov. 19, '36.) 27861.
SEPARATION OF HEAVY FROM LIGHT CONSTITUENTS in fluid suspensions.—H. Freeman. (United States, Aug. 24.) 27862.
MANUFACTURE OF 3-PHENYL-ETHYL-ALCOHOL and homologues thereof.—W. W. Groves (I. G. Farbenindustrie.) (May 7, '36.) 27269.
WATERPROOFING OF TEXTILE MATERIALS.—W. W. Groves (I. G. Farbenindustrie.) 27506.
MANUFACTURE OF ORTHO- and para-nitrophenyl thiofluoromethyl sulphones.—W. W. Groves (I. G. Farbenindustrie.) 27854.
GENERATION OF ACETYLENE, ETC.—J. Haworth. 27179.
POLYMERISATION OF GASES.—Houdry Process Corporation. (United States, Nov. 7, '36.) 27718.
CELLULOSE ESTER COMPOSITIONS.—H. M. Hutchinson, Distillers Co., Ltd., and H. P. Staudinger. 27288.
PRODUCTION OF PURE RARE GASES.—I. G. Farbenindustrie. (Germany, Oct. 9, '36.) 27271.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, Oct. 9, '36.) 27466.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, Dec. 5, '36.) 27467.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, Jan. 6.) 27468.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, Jan. 11.) 27469.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, April 10.) 27470.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, June 19.) 27471.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, June 24.) 27472.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, June 25.) 27473.
PRODUCTION OF POLYVALENT ALCOHOLS.—I. G. Farbenindustrie. (Germany, July 8.) 27474.
TREATMENT OF TEXTILE FIBRES, ETC.—I. G. Farbenindustrie. (Germany, Oct. 15, '36.) 27713.
MANUFACTURE OF POLYMERISED VINYL COMPOUNDS.—I. G. Farbenindustrie. (Germany, Nov. 20, '36.) 27856.
PRODUCTION OF ALLOYS OF ALUMINIUM with calcium.—I. G. Farbenindustrie. (Germany, Jan. 29.) 27864.
MANUFACTURE OF PRODUCTS rich in unsaturated hydrocarbons.—G. W. Johnson (I. G. Farbenindustrie.) 27884.

Specifications Open to Public Inspection

PHOTOGRAPHIC DEVELOPERS.—I. G. Farbenindustrie. April 11, 1936. 9723/37.
METHODS OF RENDERING VESSELS VACUUM-TIGHT.—British Thomson-Houston Co., Ltd. April 8, 1936. 9806/37.
METHOD OF INTRODUCING AN ALKALI or alkaline-earth metal into an exhausted receptacle.—Naamlooze Vennootschap Philip's Gloeilampenfabrieken. April 9, 1936. 9808/37.
PROCESS FOR THE PURIFICATION of 4-amino-benzene-sulphonamide.—I. G. Farbenindustrie. April 7, 1936. 9902/37.
PROCESS FOR THE MANUFACTURE OF MAGNESIUM-TITANIUM-SPINELL. Titanges. April 7, 1936. 9903/37.
PROCESS FOR THE MANUFACTURE OF POLYPHOSPHATES.—H. Chemische Werke Vorm., and E. Albert. April 8, 1936. 9997/37.
MANUFACTURE OF INTERMEDIATE PRODUCTS FOR DYESTUFFS.—Soc. of Chemical Industry in Basle. April 9, 1936. 10144/37.
MANUFACTURE OF DERIVATIVES of azo-dyestuffs.—Soc. of Chemical Industry in Basle. April 9, 1936. 10146/37.
PROCESS FOR PRODUCING COLOURED MASSES.—Soc. of Chemical Industry in Basle. April 9, 1936. 10148/37.
INSECTICIDES.—I. G. Farbenindustrie. April 11, 1936. 10149/37.
MANUFACTURE AND USE OF METAL DERIVATIVES of high molecular organic hydroxy compounds.—Deutsche Hydrierwerke, A.-G. April 9, 1936. 10211/37.
PROCESS FOR PREPARING HEXYLRESORCIN SULPHONIC ACIDS and salts thereof.—H. Legerlotz. April 9, 1936. 10224/37.
PROCESS FOR THE PRODUCTION OF ARTIFICIAL RUBBER.—R. H. A. M. Bamberger. April 11, 1936. 10355/37.
MANUFACTURE OF MONOAZO-DYESTUFFS.—I. G. Farbenindustrie. April 11, 1936. 10371/37.
PROCESS FOR THE RECOVERY OF AMMONIA from used cuprammonium artificial-silk precipitation liquors.—I. G. Farbenindustrie. April 11, 1936. 10422/37.
AN IMPROVED PROCESS OF PREPARING NITRATED DERIVATIVES of hydroformed naphthas and products thereof.—Standard Oil Development Co. Oct. 16, 1935. 27132-4/37.
PHOTOGRAPHIC PAPERS HAVING STRIPPING SUBSTRATA.—I. G. Farbenindustrie. Jan. 30, 1936. 26953/37.

Specifications Accepted with Date of Application

MANUFACTURE OF REACTION PRODUCTS of aromatic hydrocarbons with halogenated aliphatic hydrocarbons, particularly for lubricating purposes.—A. W. Nash, T. G. Hunter, W. R. Wiggins, A. P. Lowes, and Imperial Chemical Industries, Ltd. April 7, 1936. 473,334.
MANUFACTURE OF ALIPHATIC HALOGEN-NITRO-ALCOHOLS.—I. G. Farbenindustrie. April 4, 1935. 473,143.
ELECTRODEPOSITION OF ZINC.—Imperial Chemical Industries, Ltd. April 4, 1935. 473,147.
ANTI-FREEZE LIQUIDS for heat-exchangers and the like.—E. I. du Pont de Nemours and Co. April 11, 1935. 473,292.
MANUFACTURE OF HYDROGEN PEROXIDE.—G. Zotos. April 9, 1936. 473,342-4.
MANUFACTURE OF HYDROGEN PEROXIDE.—G. Zotos. April 9, 1936. 473,294.
APPARATUS FOR RECONDITIONING OILS.—G. Zotos. April 9, 1936. 473,345.
PROCESS FOR PRODUCING DAMASK EFFECTS on vegetable and artificial fibrous materials.—I. G. Farbenindustrie. April 18, 1935. 473,304.
MANUFACTURE OF TITANIUM PIGMENTS.—British Titan Products Co., Ltd., R. W. Ancrum, and A. G. Oppegaard. April 9, 1936. 473,312.
PROCESS FOR THE MANUFACTURE OF CALCINED PHOSPHATES.—Kali-Chemie, A.-G. May 14, 1935. 473,313.
PROCESS FOR THE MANUFACTURE OF UREA and formaldehyde varnishes and product obtained.—P. Michaut. Sept. 25, 1935. 473,078.
SPLITTING AND DESTRUCTIVE HYDROGENATION OF CARBONACEOUS SUBSTANCES.—G. W. Johnson (I. G. Farbenindustrie.) April 28, 1936. 473,082.
PROCESS OF AND APPARATUS FOR THE PRODUCTION OF MAGNESIUM. I. G. Farbenindustrie. May 7, 1936. 473,209.
TREATMENT OF TARS and mineral oils containing paraffin wax.—Deutsche Erdöl, A.-G. Aug. 8, 1935. 473,100.
MANUFACTURE OF SOAP.—A. Welter. June 4, 1936. 473,220.
DESTRUCTIVE HYDROGENATION of solid carbonaceous materials. S. Fujikawa. Oct. 17, 1936. 473,107.
PURIFICATION OF LIQUIDS.—Soc. Anon Pour Tous Appareillages Mecaniques. Feb. 7, 1936. 473,108.
ALUMINIUM ALLOYS.—W. H. A. Thiemann (I. G. Farbenindustrie.) Jan. 25, 1937. 473,226.
PROCESS FOR PREPARING METAL SULPHHYDRYL COMPOUNDS from keratin degradation products.—R. Von Wulffing, and E. Rosskoth (trading as J. A. Wulffing (firm of)), E. Sturm, and R. Fleischmann. March 17, 1937. 473,240.

Forthcoming Events

Hull.

November 2.—Hull Chemical Engineering Society at the Hull Photographic Society's Room, Grey Street, Park Street, at 7.45 p.m. Hugh Griffiths, "Solvent Recovery by Absorption Processes."

Liverpool.

November 2.—Chemical Society at the Chemistry Lecture Theatre of the University at 6 p.m. Professor R. G. W. Norrish, "Recent Development in the Study of Free Radicals by Photochemical Methods."

Birmingham.

November 2.—Electrodepositors' Technical Society at the James Watt Memorial Institute, Gt. Charles Street, at 7.30 p.m. A. I. Wynne-Williams, "The Production of Nickel Sheets by Electrodeposition."

London.

November 3.—Society of Public Analysts and Other Analytical Chemists at Burlington House, Piccadilly, W.1, at 8 p.m.

November 4.—The Chemical Society at Burlington House, Piccadilly, W.1, at 8 p.m. Ordinary Scientific Meeting.

November 8.—Institute of Plastics Industry at British Industries House, Marble Arch, W.1, at 7.30 p.m. C. M. Hamilton, "The Application of Some Plastics to the Cable Industry." University of London, at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, at 5.30 p.m. Professor Artturi I. Virtanen, "Biological Nitrogen Fixation: The Chemical Mechanism of the Nitrogen Fixation."

November 9.—Institution of Chemical Engineers at the Rooms of the Geological Society, Burlington House, Piccadilly, W.1, at 6 p.m. C. H. Boyd, "The Special Areas of England and Wales, Technical and Economic Aspects of the Commissioner's Work."

Bristol.

November 4.—Society of Chemical Industry in the Chemical Department of the University, Woodland Road, at 7.30 p.m. E. L. Crossley, "Modern Developments in Dairy Bacteriology."

Cardiff.

November 4.—Institute of Chemistry (Cardiff and District Section) at the Technical College at 7 p.m. Dr. A. E. Dunstan will present a film of recent operations of the Anglo-Iranian Oil Co., in Iran.

Manchester.

November 4.—Institute of Vitreous Enamellers, at Queen's Hotel, Piccadilly, at 7.30 p.m. H. Cowan, "Analyses of Cast Iron Suitable for Vitreous Enamelling."

Bangor.

November 5.—Chemical Society (North Wales Section) in the Chemistry Lecture of the University College of North Wales, at 5.30 p.m. Professor C. K. Ingold, "Exchange between Light and Heavy Hydrogen."

Glasgow.

November 5.—Chemical Engineering Group—Joint meeting with the Glasgow Section of the Society of Chemical Industry, at the Royal Technical College, 7.45 p.m. Dr. C. H. Desch, "The Alloys of the Light Metals."

Newcastle.

November 5.—Chemical Industry Club, at 5 Lovaine Row. Col. K. C. Appleyard, "Planning for Industry."

November 9.—Institute of Chemistry (Newcastle-upon-Tyne and North-East Coast Section), Society of Chemical Industry and Institute of Metals. Visit to Imperial Chemical Industries, Ltd. Coal Hydrogenation Plant, Billingham.

Sheffield.

November 9.—Society of Glass Technology. 21st Anniversary Celebrations. 12.45 p.m. Luncheon at the Grand Hotel. 3.15 p.m. Functions at Elmfield. 6 p.m. Presidential Address at the Chemistry Lecture Theatre, The University. 7.45 p.m. Informal Dinner at the Grand Hotel.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 33 Old Queen Street, London, S.W.1 (quote reference number).

British India.—H.M. Trade Commissioner at Calcutta reports by air mail that the Indian Stores Department is calling for tenders (Order No. M 1040) for the supply and delivery of first and second quality fuel oil and Panlanyen oil, as and when required during the period March 1, 1938, to February 28, 1939. The oil is required for internal combustion engines of the semi-diesel and diesel type, and for burning in boiler furnaces. Tenders should be addressed to the Chief Controller of Stores, Indian Stores Department (Miscellaneous Section), New Delhi, by whom they will be received up to December 13, 1937. (Ref. T. 20066/37.)

Malta.—A firm of merchants and commission agents established at Valletta wishes to obtain the representation of United Kingdom manufacturers of pharmaceutical goods. (Ref. No. 283.)

Palestine.—A firm in Tel-Aviv wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals. (Ref. No. 287.)

Books Received

Sodium Carbonate for Metal Refining. Pp. 55. London: Imperial Chemical Industries, Ltd.

High Temperature Welding Flames. By D. Seferian. Translated by N. F. Daniel. Pp. 50. London: Penton Publishing Co., Ltd. 3s. 9d.

Chemical and Allied Stocks and Shares

THE general tendency in the industrial and other sections of the Stock Exchange has been to lower levels, share values having continued to move closely with the trend of New York markets. Although production of steel and other indices confirm that recently trade in the United States has become less active, there is a growing disposition to view this merely as temporary period of rest and readjustment after the encouraging progress made in the past twelve months.

Shares of companies operating in the chemical and kindred trades moved somewhat irregularly. Although in numerous cases they reflected the general trend to lower prices, steady features were not lacking. Borax Consolidated at 29s. are within a few pence of the price ruling a week ago, while Triplex Glass have moved up 2s. 6d. to 60s. at the time of writing. United Molasses at 27s., show a decline of only 3d. on the week despite somewhat sharp fluctuations. The market remains hopeful the dividend on these 6s. 8d. units may be brought up to around 20 per cent., and there is still talk that the forthcoming results may announce a bonus in the form of a writing up of the nominal value of the units. Associated Portland Cement at 88s. 9d. have not held best prices, but British Plaster Board 5s. shares were little changed at 31s. 4½d. on the continued assumption that the impending interim payment will be kept at 20 per cent.

Imperial Chemical at 36s. 4½d., show a decline of a few pence. In recent weeks they have had a steadier appearance than most other leading industrial shares. This reflects to the market view that there appear reasonable prospects of the dividend being raised from 8 per cent. to 8½ per cent., or possibly 9 per cent. This is due to the fact that the interim was raised to 3 per cent., although it may be recalled that in making the announcement the directors stated the increase was merely to bring the interim more in relation to the final payment. Distillers have risen sharply on the week from 103s. 9d. to 107s. Although the yield is moderate it has to be read in relation to the fact that

last year's increased distribution of 22½ per cent. represented a conservative treatment of profits and that the exceptional strength of the balance sheet is assumed in many quarters to warrant hopes of a scrip bonus in the course of time.

William Blythe at 5s. 9d., British Glues at 7s. 3d., and British Industrial Plastics at 2s. 10½d. were maintained around the same prices as a week ago. British Drug Houses showed rather more activity and changed hands around 23s. 3d. at which a yield of over 5 per cent. is given on the basis of last year's increased dividend of 6 per cent. British Match were steady at 35s. The latter company has a very steady dividend record. Last year 7½ per cent. was paid; the interim payment falls shortly and the market is confidently anticipating it will be maintained at 2½ per cent. Monsanto Chemicals 5½ per cent. preference transferred around 22s. 3d. and the 5s. ordinary units of Greiff-Chemicals Holdings at 7s.

British Oxygen were steadier, pending next month's interim dividend announcement. If the company's hydro-electric and carbide works proposals in Scotland are approved by the authorities, it is assumed in the market that further capital may be required, part of which might possibly be raised by an offer of additional shares to shareholders at a price involving a bonus. Imperial Smelting were active at 15s. 3d.

Stanton Ironworks were rather lower on the maintenance of the interim dividend, although there are hopes of a larger final dividend if the company's profits remain around the excellent level shown in the previous year. Richard Thomas and Whitehead Iron and Steel were fairly steady, awaiting the interim dividend announcements, due next month. Dorman Long fluctuated; in this case the final dividend is due in November.

Oil shares failed to benefit from the excellent impression created by the Anglo-Iranian interim dividend. Despite the much larger capital arising from the bonus, this payment is being maintained at 5 per cent.

Weekly Prices of British Chemical Products

THE chemical markets have followed a very steady course during the week, there being no outstanding movements to report in any direction. A moderate demand has been maintained for most of the heavy chemicals and although the volume of fresh spot business is on a fairly good scale buyers are generally restricting their requirements to quantities that are sufficient for immediate needs. Values are very steady and quotations for most of the general chemicals are unaltered and firm; similar conditions prevail in other sections of the market, there being no price changes to record for wood distillation products or rubber chemicals. The general outlook is regarded as satisfactory with prices continuing on a firm basis. Trade in the coal tar section is dull, there being a certain amount of marking-time in progress. Values throughout this section are unchanged at recent levels and prices are expected to continue firm.

MANCHESTER.—International uncertainties continue to exercise

a restrictive influence on buying in a number of sections of the Manchester chemical market and actual fresh business since last report has been on no more than a moderate scale. There is a steady flow of specifications, however, for contract deliveries of a wide range of textile chemicals for the bleaching, dyeing and finishing trades in Lancashire, and in most other directions, also, the movement into consumption is on a fairly satisfactory scale. Quotations in most sections are steady. In the case of the by-products, crude tar and the majority of the light distillates are being called for in fair quantities. The scarcity and high price of pyridine is still a feature.

GLASGOW.—There has been a further improvement in the demand for chemicals for home trade during the week, though export business remains very quiet. Prices generally continue quite steady at about previous figures, with no actual changes to report, though the undertone continues very firm.

General Chemicals

ACETONE.—£45 to £47 per ton.

ACETIC ACID.—Tech., 80%, £28 5s. per ton; pure 80%, £30 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 7s. 6d.

ALUMINIUM SULPHATE.—£7 per ton d/d Lancs.; GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £17 10s. per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Sal ammoniac.)

AMMONIUM DICHROMATE.—8d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £17 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£5 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—9½d. per lb., less 2½%; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. 0½d. per lb., less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £20 per ton f.o.b. SCOTLAND: £22 per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£22 10s. per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £5 7s. 6d. to £6 7s. 6d. per cwt. according to quantity; in drums, £5 to £5 13s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. to 7s. 6d. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots) Dark, 50% by volume, £23 10s.; by weight, £27 10s.; Pale, 50% by volume, £27; by weight, £32 per ton. LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £33 10s.; brown, £1 per ton less. MANCHESTER: White, £36; brown, £35.

LEAD NITRATE.—£34 per ton for 1-ton lots.

LEAD, RED.—£33 15s. per ton, less 2½% carriage paid. SCOTLAND: £33 per ton, less 2½%, carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £33 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 11d. per lb.; powder B.P., 6s. 1d.; bichloride B.P. (corros. sub.) 5s. 2d.; powder B.P. 4s. 10d.; chloride B.P. (calomel), 5s. 11d.; red oxide cryst. (red precip.), 7s.; levig. 6s. 6d.; yellow oxide B.P. 6s. 4d.; persulphate white B.P.C., 6s. 1d.; sulphide black (hyd. sulph. cum sulph. 50%), 6s. For quantities under 112 lb., 1d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—80° Tw. spot, £16 10s. per ton makers' works.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

POTASH CAUSTIC.—Solid, £35 5s. to £36 15s. per ton for 2-ton lots ex store; broken, £42 per ton. MANCHESTER: £39.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4½d. per lb. MANCHESTER: £38 per ton.

POTASSIUM DICHROMATE.—SCOTLAND: 5d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. Crystals, 9½d. MANCHESTER: B.P. 10½d. to 1s.

POTASSIUM PRUSSIAN.—6½d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d.

SALAMMONIAC.—Dog-tooth crystals, £26 per ton, fine white crystals, £16 10s. per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Upground, spot, £3 to £3 10s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £12 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks. Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£18 per ton carriage paid North. GLASGOW: £18 per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE MONOHYDRATE.—£15 5s. per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£26 10s. to £30 per ton. GLASGOW: £1 10s. per cwt., minimum 3 cwt. lots.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM DICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. MANCHESTER: 4d. per lb. GLASGOW: 4d., net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £14 10s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—£10 10s. to £11 per ton delivered (Di-basic).
SODIUM PRUSSIAN.—d. per lb. for ton lots. GLASGOW: 5d. to 5½d. ex store. MANCHESTER: 4d. to 4½d.
SODIUM SILICATE.—£9 10s. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 5s. per ton d/d in drums; crystals 30/32%, £8 15s. per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station of 5 cwt. and upwards. MANCHESTER: 1s. 1½d. per lb.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1½d. per lb. GLASGOW: 1s. 1d. per lb.
ZINC SULPHATE.—Tech., £12 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb., according to quality.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—7s. 8d. to 7s. 11d. per lb.
CARBON BLACK.—4½d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 1s. 2d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4½d. to 5½d. per lb.; dark 4d. to 4½d. per lb.
LAMP BLACK.—£28 to £30 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—30%, £16 10s. to £17 5s. per ton.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILLION.—Pale, or deep, 5s. 3d. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6 = nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.
NITRO CHALK.—£7 10s. 6d. per ton for delivery up to June 30, 1938.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d.
CARBOLIC ACID.—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 4s. to 4s. 3d., dehydrated, 4s. 6d. to 4s. 9d. per gal. MANCHESTER: Crystals, 9½d. to 10d. per lb. f.o.b. in drums; crude, 4s. 4d. per gal. GLASGOW: Crude, 60's, 4s. 3d. to 4s. 6d. per gal.; distilled, 60's.
CREOSOTE.—Home trade, 6½d. to 6¾d. per gal., f.o.r. makers' works; exports, 6¾d. to 6¾d. per gal., according to grade. MANCHESTER: 5½d. to 6½d. GLASGOW: B.S.I. Specification, 6d. to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr. oils, 5½d. to 6½d.
CRESYLIC ACID.—97/99%, 5s. to 5s. 2d.; 99/100%, 5s. to 5s. 9d. per gal., according to specification; Pale, 99/100%, 5s. 3d. to 5s. 5d. per gal.; Dark, 95%, 4s. 5d. to 4s. 7d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale 97/99%, 4s. 6d. to 4s. 10d.; dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification, 4s. 3d. to 4s. 6d. MANCHESTER: Pale, 99/100%, 4s. 8d.

NAPHTHA.—Solvent, 90/160, 1s. 6½d. to 1s. 7½d. per gal.; solvent, 95/160%, 1s. 8d. to 1s. 9d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7½d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £9 to £10 per ton; purified crystals, £18 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 10s. to £7 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £19 per ton f.o.b.
PITCH.—Medium, soft, 38s. per ton, f.o.b. MANCHESTER: 36s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.
PYRIDINE.—99/140%, 12s. to 14s. per gal.; 90/160%, 11s. to 12s. per gal.; 90/180%, 3s. to 3s. 6d. per gal., f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 12s. to 13s. 6d. per gal.
TOLUOL.—90%, 1s. 1½d. per gal.; pure, 2s. 5d. GLASGOW: 90%, 120, 1s. 10d. to 2s. per gal.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £8 to £8 10s. per ton; grey, £10 10s. to £11 10s. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.
METHYL ACETONE.—40-50%, £42 to £45 per ton.
WOOD CREOSOTE.—Unrefined 6d. to 9d. per gal., according to boiling range.
WOOD, NAPHTHA, MISCIBLE.—2s. 8d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.
WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 5d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 9½d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—1s. 1½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLOROBENZENE, SOLID.—£72 per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 10d.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
GAMMA ACID.—Spot, 4s. per lb., 100% d/d buyer's works.
H ACID.—Spot, 2s. 4½d. per lb., 100% d/d buyer's works.
NAPHTHIONIC ACID.—1s. 8d. per lb.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—9½d. to 9¾d. per lb.; flake, 9½d. to 9¾d.
α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 9½d. in casks.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. per lb., 100%.
m-NITRANILINE.—3s. 1½d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. to 2s. 1d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9½d. to 10d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb., 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8d. per lb., 100%, d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10-cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON, Oct. 27.—LINSEED OIL was easy. Spot, £31 5s. per ton (small quantities), Nov. and Dec., £28 15s.; Jan.-April, £28 12s. 6d.; May-Aug., £28 10s., naked. SOYA BEAN OIL was quiet. Oriental, spot, ex tank Rotterdam, £21 7s. 6d. per ton. RAPE OIL was slow. Crude, extracted, £37 per ton; technical refined, £38, naked, ex wharf. COTTON OIL was steady. Egyptian, crude, £22 per ton; refined common edible, £26 5s.; deodorised, £28 5s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American, spot, 31s. 9d. per cwt.; Nov.-Dec. delivery, 32s.; Jan.-April, 33s.
 HULL.—LINSEED OIL.—Spot, quoted £30 7s. 6d. per ton; Oct., £29 15s.; Nov.-Dec., £29 10s.; Jan.-April, £29; May-Aug., £28 17s. 6d. COTTON OIL.—Egyptian, crude, spot, £22 10s. per ton; edible, refined, spot, £25 10s.; technical, spot, £25 10s.; deodorised, £27 10s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £23 10s. per ton, naked. GROUNDNUT OIL.—Extracted, spot, £30 per ton; deodorised, £33. RAPE OIL.—Extracted, spot, £36 per ton; refined, £37. SOYA OIL.—Extracted, spot, £28 10s. per ton; deodorised, £31 10s. COD OIL.—F.o.r. or f.a.s., 27s. 6d. per cwt. in barrels. CASTOR OIL.—Pharmaceutical, 45s. 6d. per cwt.; first, 40s. 6d.; second, 38s. 6d. TURPENTINE.—American, spot, 34s. per cwt.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

BABBITT PRODUCTS, LTD., London, N.W., soap manufacturers, etc. (M., 30/10/37.) October 18, £600 debentures, part of £5,000 already registered.

LADDERIX, LTD., Slough, chemical manufacturers. (M., 30/10/37.) October 19, £5,000 debenture, to A. E. White-law, London; general charge.

Satisfactions

BRITISH INDESTRUCTO GLASS, LTD., London, E.C. (M.S., 30/10/37.) Satisfaction October 13, of debentures registered October 29, 1936, to extent of £1,500.

Company Winding-Up Voluntarily

DR. GILBERT'S BIOCHEMICALS, LTD. (C.W.U.V., 30/10/37.) Resolved October 14. H. S. Hardwick, 164 Rushey Green, S.E.6, appointed liquidator.

Voluntary Liquidation

THE CHESHIRE SOAP CO., LTD., Manchester.—The statutory meeting of creditors was held on October 25, at the Exchange Hotel, Fennel Street, Manchester, when it was reported that the usual resolution for the voluntary liquidation of the company could not be passed by the shareholders as there was no quorum. According to the statement of affairs which was submitted the ranking liabilities were £1,582, and total assets were £311, or a deficiency, so far as the creditors were concerned, of £1,271. The issued capital of the company was £900, and as regarded the shareholders the deficiency was £2,171. The deficiency was mainly attributable to bad debts of £1,380. After discussing the position the creditors passed a resolution nominating Mr. W. R. Charnley, C.A., Manchester, as liquidator of the company, whilst a committee was also appointed.

Company News

The Imperial Continental Gas Association has declared an interim dividend of 4 per cent. actual, less tax, on the £5,600,000 capital stock, payable on November 15. Similar interims were paid in the past two years, followed by finals of 6 per cent., making total distributions of 10 per cent., less tax.

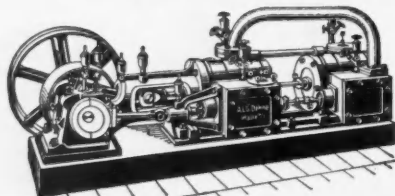
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